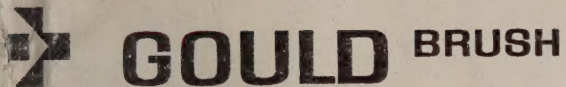
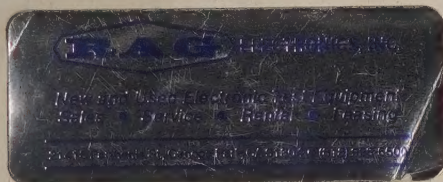


G-10

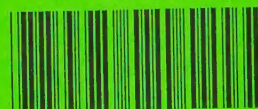


MANUAL PART NO.
806817-XX



BRUSH MODULAR RECORDER ALL MODELS

MP MASTER



MA34649

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SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

The Brush Modular Recorders (Figures 1-1 thru 1-4) are basic recorders featuring a pressurized ink writing system with crisp, clear traces. A plastic ink cartridge can be replaced in minutes. Pen motion is rectilinear across a 50mm channel.

1.2 SPECIFICATIONS

Sensitivity (Standard) 100 mv/millimeter
(Optional) 1, 10, 20, 50, mv/millimeter

Frequency Response:

D-c to 35 Hz $\pm 1\%$ 50mm peak-to-peak

D-c to 100 Hz -3 dB 10mm peak-to-peak

Input Circuit Single-ended, floating

Input Impedance 50K ohms

Noise 0.1 division ($R_s = 5K$ ohms)

Non-Linearity $\pm 0.5\%$ full scale

In-Phase Rejection 60 dB at 60 Hz ($R_s = 1K$ ohm)

Trace Presentation Rectilinear

Trace Width 0.01 inch nominal

Writing System Pressurized ink

Pen Limiting Electronic

Chart Paper Length 150 foot roll

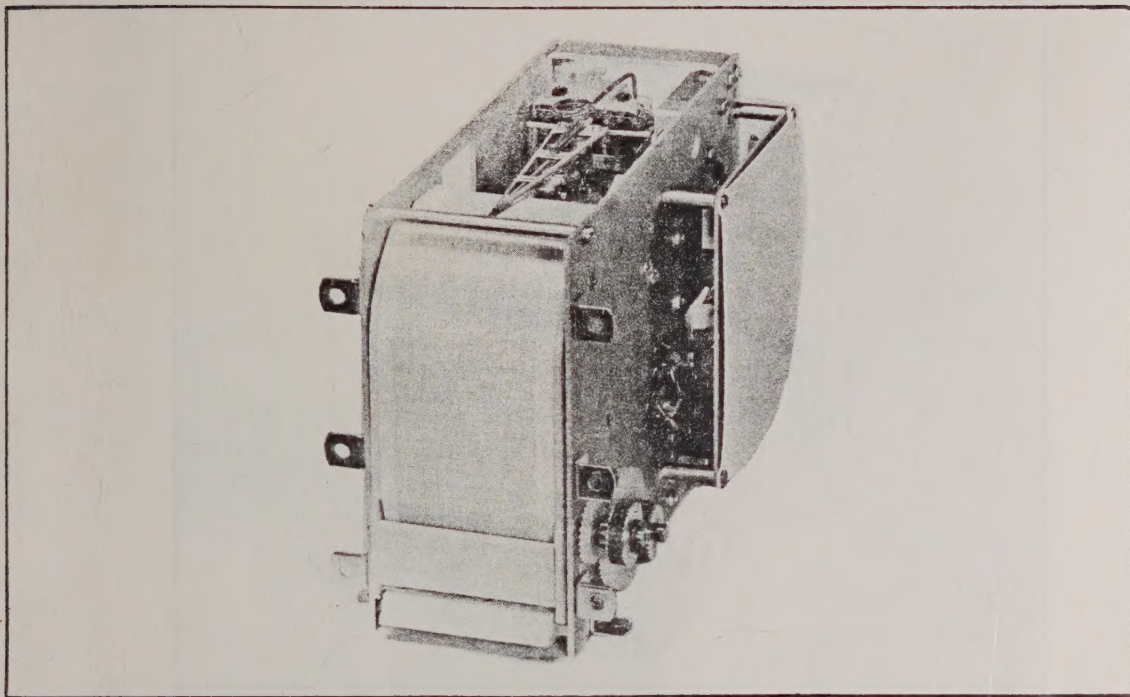


FIGURE 1-1 SINGLE-CHANNEL VERTICAL RECORDER

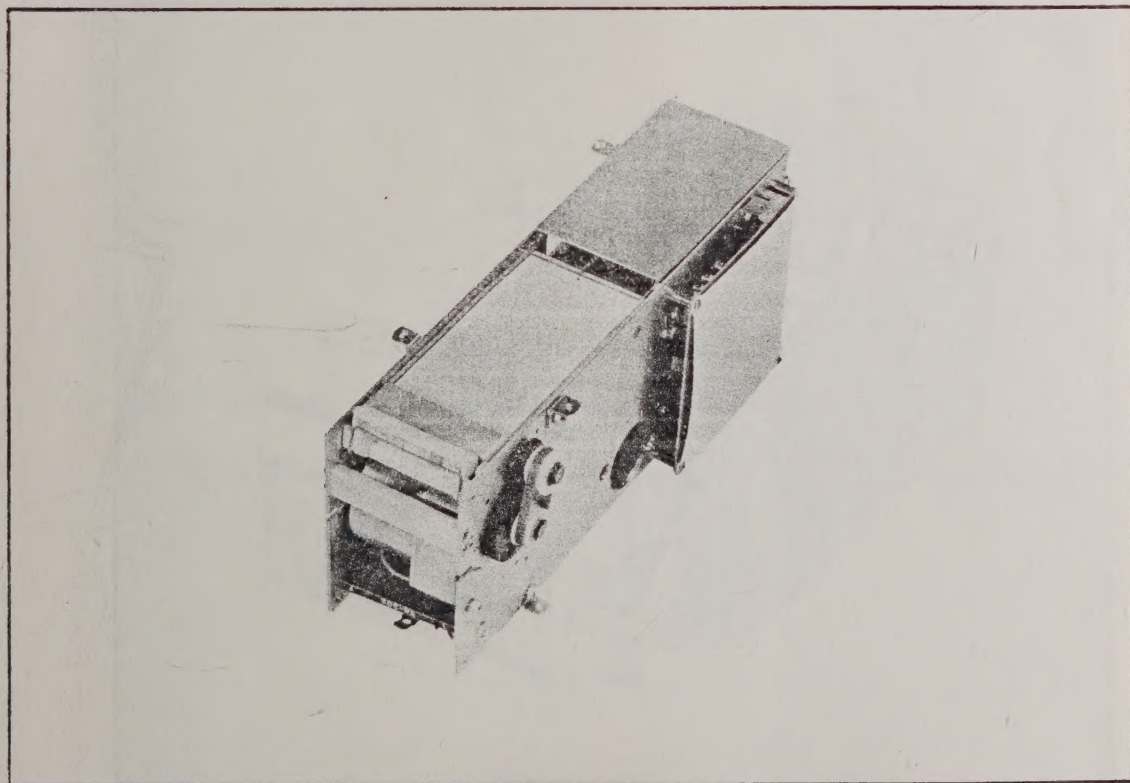


FIGURE 1-2 SINGLE-CHANNEL LOW-PROFILE RECORDER

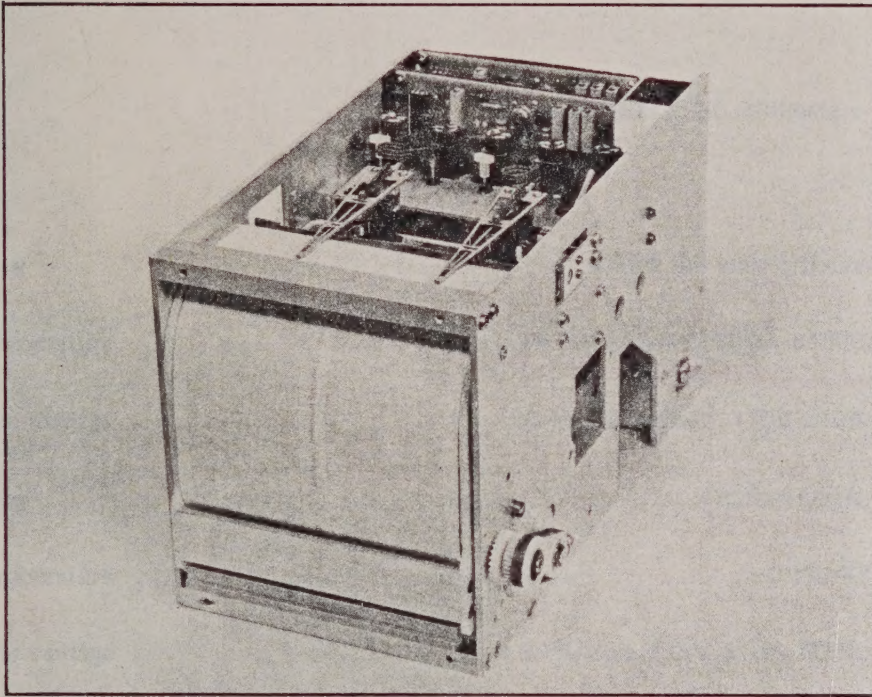


FIGURE 1-3 DUAL-CHANNEL VERTICAL RECORDER

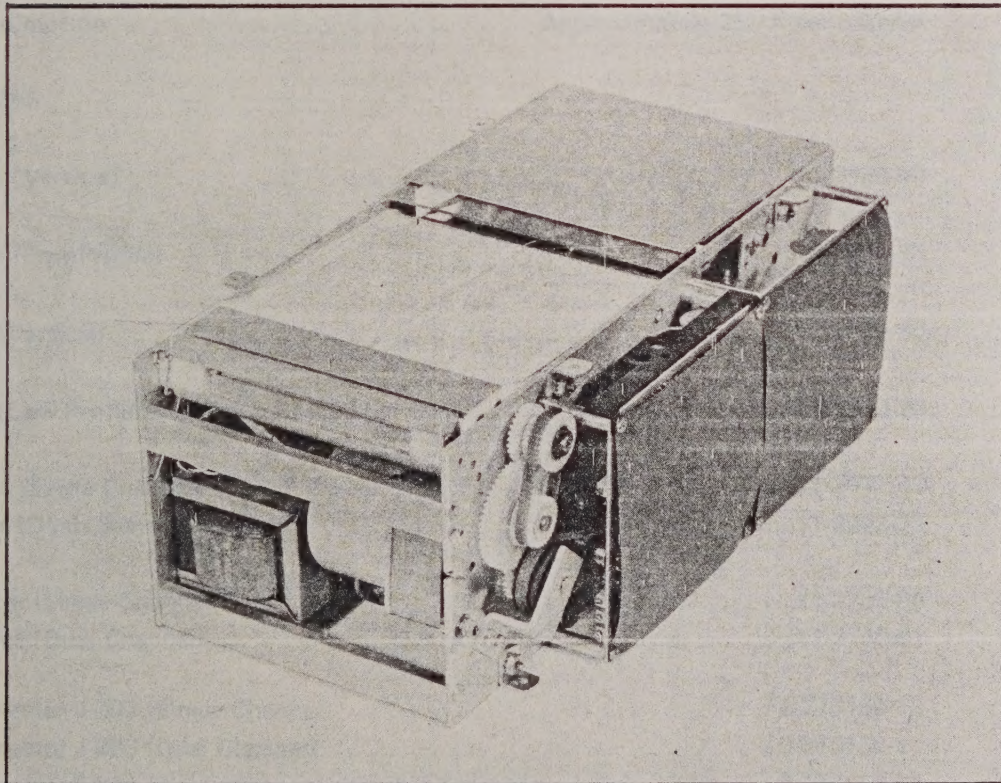
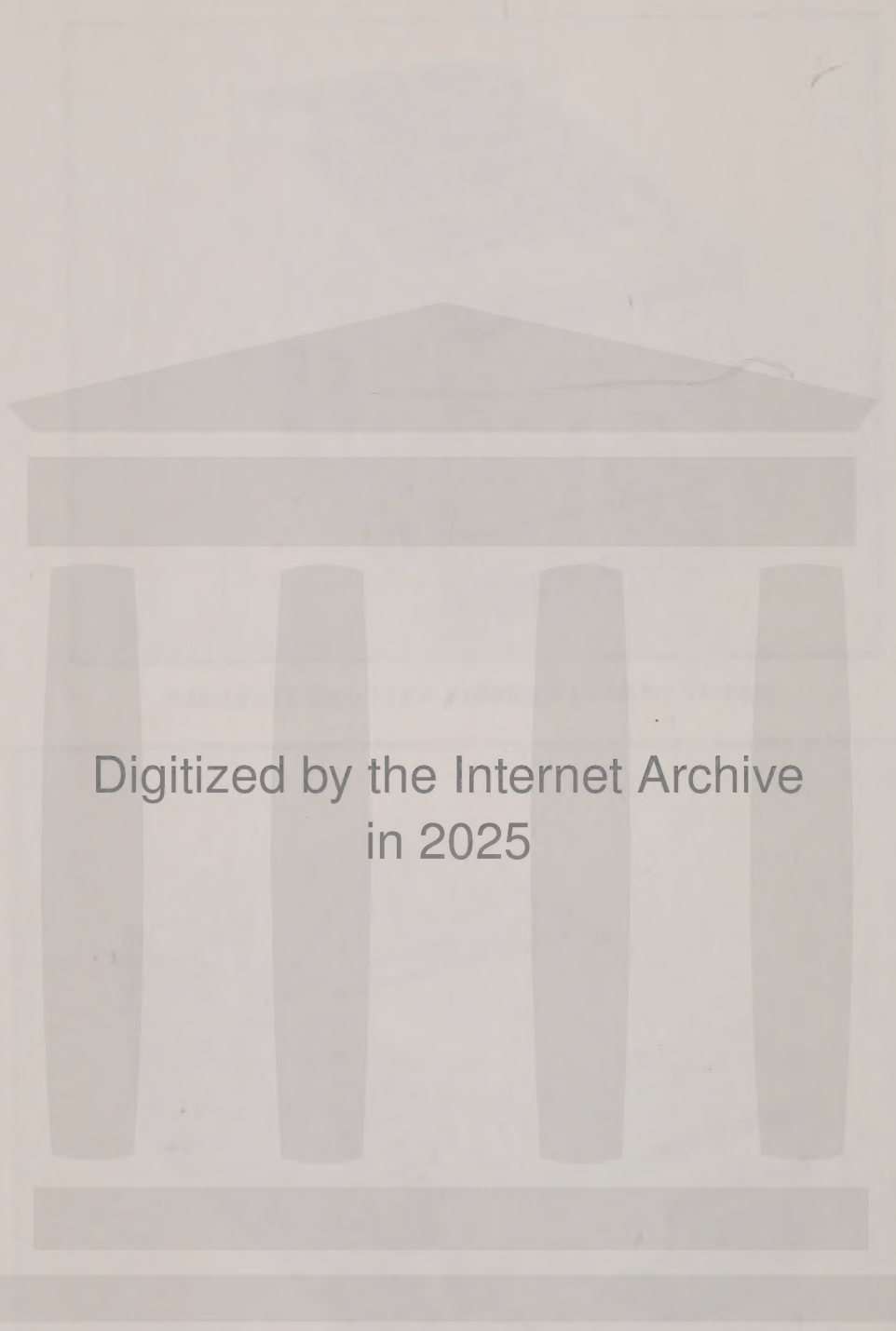


FIGURE 1-4 DUAL-CHANNEL LOW-PROFILE RECORDER



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https://archive.org/details/manualsplus_06192

Chart Divisions 50 divisions in 50 millimeters

Stability

- Zero with Time $\pm 0.2\%$ full scale/8 hours
- Zero with Temperature $\pm 0.2\%$ full scale/ $^{\circ}\text{C}$, 25°C , $\pm 10^{\circ}\text{C}$
- Zero with Line Voltage $\pm 0.1\%$ full scale/V, $115\text{V} \pm 10\%$
- Gain with Time $\pm 0.2\%$ /8 hours
- Gain with Temperature $\pm 0.1\%$ / $^{\circ}\text{C}$
- Gain with Line Voltage $\pm 0.1\%$ /Volt, $115\text{V} \pm 10\%$, 60 Hz

Power Input $115\text{V} \pm 10\%$, 60 Hz
Optional: 230V, 50Hz

Power Consumption Approximately 25VA per channel

1.3 SUPPLIES

- Analog Pen (Vertical) 11-2823-40
- Analog Pen (Low Profile) 11-2823-33
- Event Pen (Vertical) 11-2873-30
- Event Pen (Low Profile) 11-2873-20
- Chart Paper (Single Channel) 11-2913-22
- Chart Paper (Dual Channel) 11-2923-23
- Ink Cartridge (Single Channel) 11-2735-04
- Ink Cartridge (Dual Channel) 11-2730-01
- Input Connector J-303 (Single Channel) 9-270159-12
- Input Connector J-303 (Dual Channel) 0-270156-1
- Input Connector J-304 (Single Channel) 9-270158-12
- Input Connector J-304 (Dual Channel) 9-270158-12

Band Replacement Tool	341409-915
Gram	240601-910
Wrench, Pen Pressure Adjustment	1-120922-2
Wrench, Band Replacement (Bristol)	1-120922-3
Wrench, Pen Replacement	1-120922-18
Wrench, Band Replacement (Hex)	245218-5

1.4 ACCESSORIES

Chart Take-Up (single channel units)	11-2402-08
Chart Take-Up (dual channel units	11-6402-09
Event Marker Kit (2 channel low profile, right margin)	11-6222-03
consisting of:	
Event Marker	11-2102-92
Bracket	282192
Screw (2)	31-119916-2602

See Note

Event Marker Kit (low profile, left margin)	11-6222-04
consisting of:	
Event Marker	11-2103-91
Bracket	282192
Screw (2)	31-119916-2602

See Note

Event Marker Kit (2 channel vertical, right margin)	11-6222-05
consisting of:	
Event Marker	11-2103-92
Bracket	284407
Screw (2)	31-119918-2603

See Note

NOTE: Event pen furnished with kit only when event marker is factory installed.

Event Marker Kit (1 channel vertical, left margin)	11-6222-06
consisting of:	
Event Marker	11-2123-32
Bracket	267189
Screw (2)	31-119918-2604

See Note

Event Marker Kit (2 channel vertical, left margin)	11-6222-07
consisting of:	
Event Marker	11-2103-91
Bracket	284407
Screw (2)	31-119918-2603

See Note

NOTE: Event pen furnished with kit only when event marker is factory installed.

SECTION II

INSTALLATION

2.1 GENERAL

This section describes and illustrates proper electrical connections to the Brush Modular Recorder and installation of the Chart Take-up and Event Markers.

2.2 RECORDER POWER AND SPEED CONTROL CIRCUITS, SINGLE CHANNEL RECORDERS

Connect a-c power and speed control wiring to male input connector, J-304 (Gould Pt. No. 9-270158-12). Refer to the applicable schematic in the rear of this manual and Figure 2-1.

J-304

Pin No.	Description	Suggested Connection
1	A-c Low Input	Power Line Low
2	A-c High Input	Power Line High
3	Chassis Common	Power Line Common (ground)
4	A-c Output for unit, fused and interlocked	Common terminal of a double-pole, single-throw switch. Switched terminal of switch connects to pin 9, pin 10, and common terminal of single-pole chart speed switch that has one position for every chart speed.
5	A-c Input for second highest speed chart drive motor in recorders having two or more speeds	Second position of chart speed switch
6	A-c Input for first and highest speed chart drive motor in all recorders.	First position of chart speed switch
7	A-c Input for fourth highest speed chart drive motor in four speed recorders	Fourth position of chart speed switch
8	A-c Input for third highest speed chart drive motor in recorders having three or more chart speeds	Third position of chart speed switch

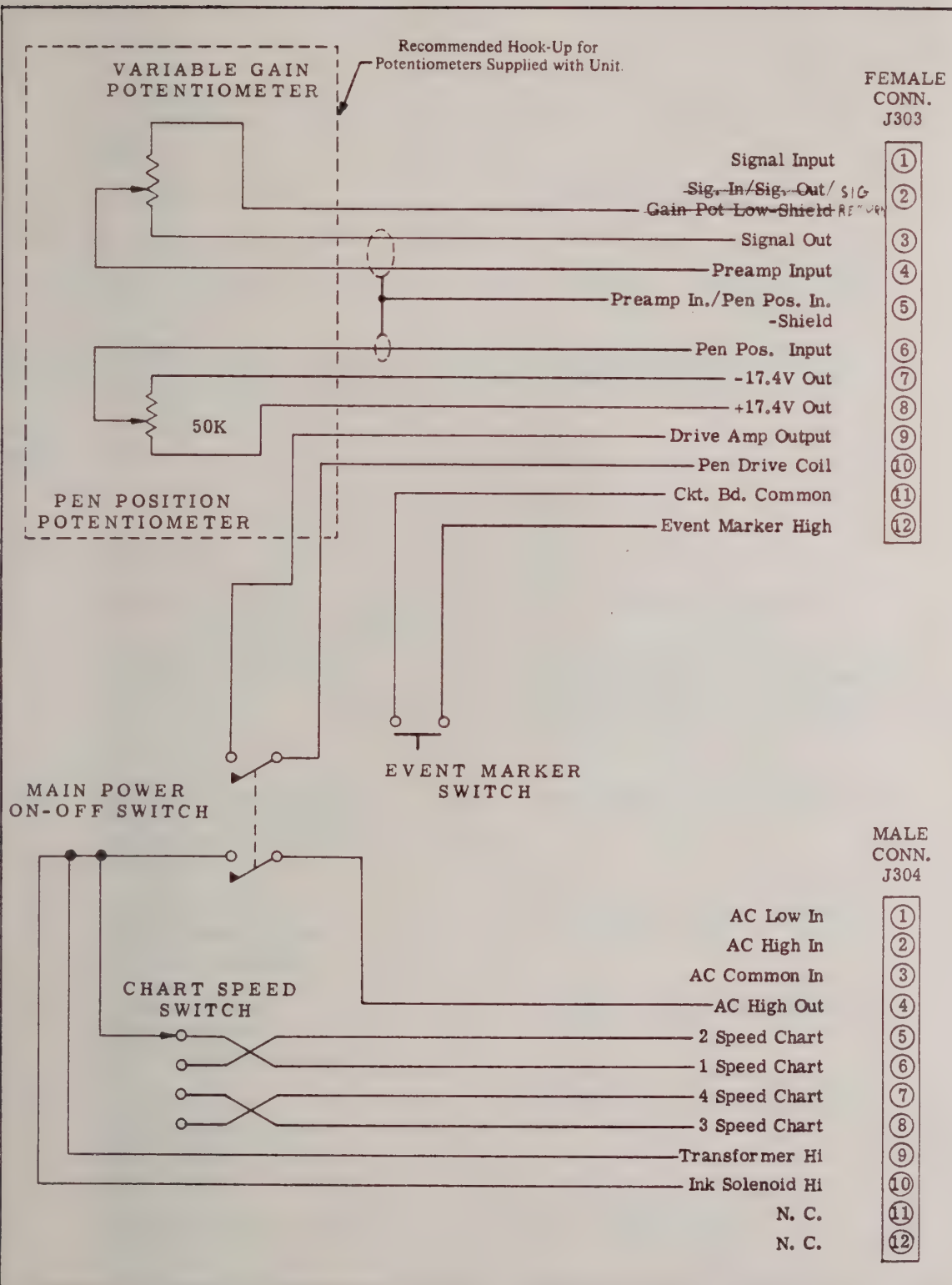


FIGURE 2-1 SINGLE CHANNEL RECORDER SUGGESTED POWER, SPEED CONTROL, CALIBRATION CONTROL AND INPUT SIGNAL CONNECTIONS.

- | | | |
|----|---|-----------------------|
| 9 | A-c Input to power transformer to supply power to drive amplifier | See pin 4 explanation |
| 10 | A-c Input to ink solenoid | See pin 4 explanation |

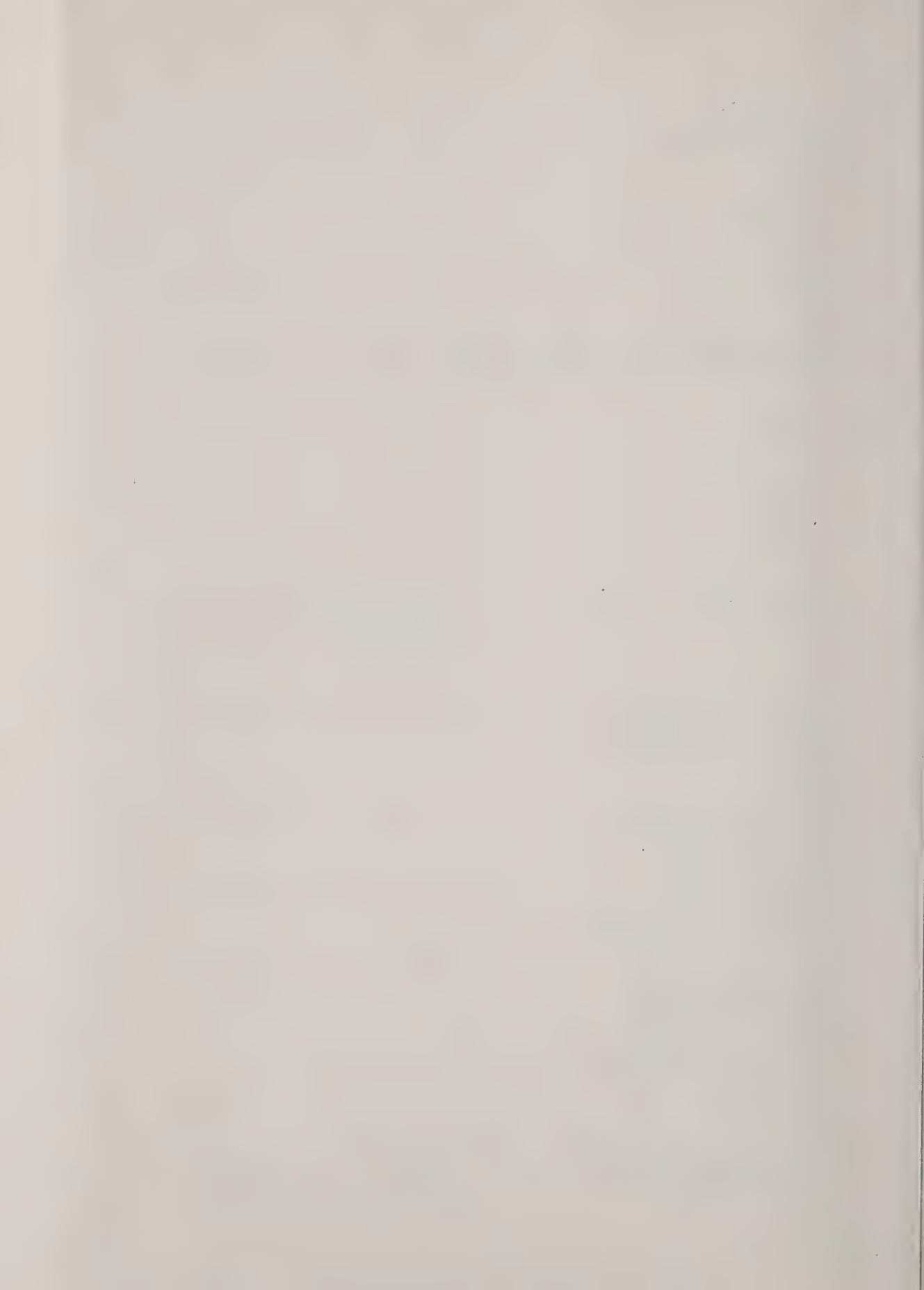
All switches must be rated for 115 volts, 1 amp, a-c.

2.3 RECORDER POWER AND SPEED CONTROL CIRCUITS, DUAL CHANNEL RECORDERS

Connect a-c power and speed control wiring to male input connector, J-304 (Gould Pt. No. 9-270158-12). Refer to the applicable schematic in the rear of this manual and Figure 2-2.

J-304

Pin No.	Description	Suggested Connection
1	A-c Neutral	Power Line Low
2	A-c Hot	Power Line High
3	Ground	Power Line Common (ground)
4	A-c output for unit, fused and interlocked	Common terminal on one section of a four-pole, single throw switch. Switched terminal of switch connects to pin 10, and common terminal of single-pole, 4 position switch.
5	A-c input for second highest speed chart drive motor in recorders having two or more speeds	Second position of chart speed switch
6	A-c input for first and highest speed chart drive motor in all recorders	First position of chart speed switch
7	A-c Input for fourth highest speed chart drive motor in four speed recorders	Fourth position of chart speed switch
8	A-c input for third highest speed chart drive motor in recorders having three or more chart speeds	Third position of chart speed switch
9	A-c input to power transformer channel one	See explanation, pin 11
10	A-c input to ink solenoid	See pin 4 explanation
11	A-c output to power transformer fused and interlocked	Connects to common terminal of one section of Main Power on-off switch; connects to pin 9 and 12.



FEMALE
CONN.
J303

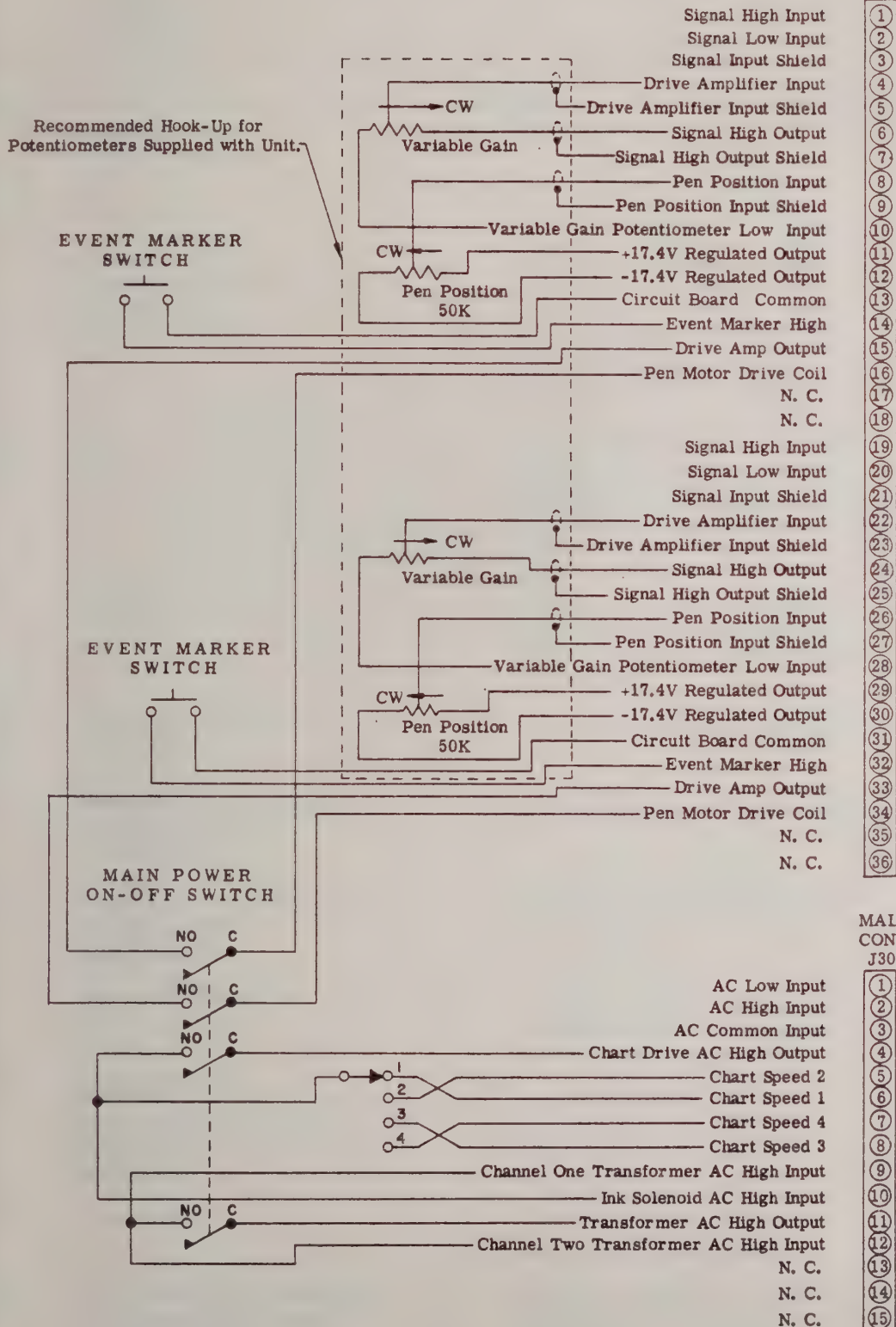


FIGURE 2-2 DUAL CHANNEL RECORDER SUGGESTED POWER, SPEED CONTROL, CALIBRATION CONTROL AND INPUT SIGNAL CONNECTIONS.

12 A-c input to power transformer
channel two

See explanation, pin 11

2.4 RECORDER INPUT SIGNAL CIRCUITS, SINGLE CHANNEL RECORDERS

Connect signal inputs and associated wiring to female connector, J-303 (Gould Pt. No. 9-270159-12). Refer to applicable schematic in the rear of this manual and Figure 2-1.

J-303

Pin No.	Description	Suggested Connection
1	Signal High Input; internally connected to pin 3	Connect signal high to this pin
2	Signal circuit common	Connect signal low, signal shield and counterclockwise end of gain potentiometer to this pin
3	Signal High Output	Clockwise end of gain potentiometer
4	Drive Amplifier signal input	NOTE: A 1 K ohm potentiometer is furnished for unit with 1 mv sensitivity. A 50K ohm potentiometer is furnished for all other sensitivities.
5	Signal circuit common	Shields for signal high output and drive amplifier signal input; also shield for drive amplifier position signal input.
6	Drive Amplifier position signal input	Wiper arm of position potentiometer
7	Negative 17.4V d-c regulated output for position potentiometer	Clockwise end of position potentiometer
8	Positive 17.4V d-c regulated output for position potentiometer	Counterclockwise end of position potentiometer
9	Drive Amplifier output	Switched terminal of one section of a DPST switch. Common ter- minal connects to pin 10.
10	Penmotor Drive coil; connecting this pin to drive amp output permits drive amplifier to control penmotor.	See pin 9 explanation
11	Circuit common	One terminal of single-pole, momentary contact switch
12	Event marker high; connecting this pin to circuit common actuates the event marker	Remaining terminal of single pole, momentary contact switch con- nected to pin 11 of J-303.

2.5 RECORDER INPUT SIGNAL CIRCUITS, DUAL CHANNEL RECORDERS

Connect signal inputs and associated wiring to female connector, J-303 (Gould Pt. No. O-270156-1). Refer to applicable schematic in rear of this manual and Figure 2-2.

J-303		Description	Suggested Connection
Ch 1	Ch 2		
1	19	Signal High Input; internally connected to pin 6	Connect signal high to this pin
2	20	Signal Low Input; internally connected to pins 3, 5, 7, 9, 10 and drive amplifier of channel 1, and pins 21, 23, 25, 27, 28 and drive amplifier of channel 2	Connect signal low to this pin
3	21	Signal shield input	Connect signal shield to this pin
4	22	Drive Amplifier signal input	Wiper arm of gain potentiometer NOTE: A 1K ohm potentiometer is furnished for units with 1 mv sensitivity. A 50K ohm potentiometer is furnished for all other sensitivities.
5	23	Signal Circuit common	Drive Amplifier input shield
6	24	Signal High output	Clockwise end of gain potentiometer
7	25	Signal Circuit common	Signal high output shield
8	26	Pen position input	Wiper arm of position potentiometer
9	27	Signal Circuit common	Position input signal shield
10	28	Signal Circuit common	Counterclockwise end of gain potentiometer
11	29	Positive 17.4V d-c regulated output for position potentiometer	Counterclockwise end of position potentiometer
12	30	Negative 17.4V d-c regulated output for position potentiometer	Clockwise end of position potentiometer
13	31	Circuit board common	One terminal of single pole, momentary contact switch
14	32	Event marker high; connecting this pin to circuit common actuates the event marker	Remaining terminal of single pole, momentary contact switch

15	33	Drive Amplifier Output	Switched terminal of one section of a four-pole single throw switch. Common terminal connects to pin 16 of channel 1, and pin 34 of channel 2.
16	34	Penmotor Drive coil; connecting this pin to drive amp output permits drive amplifier to control penmotor.	See pin 15 and 33 explanation
17	35	No connection	
18	36	No connection	

2.6 OUTLINE DIMENSIONS

Refer to Figures 2-3, 2-4, 2-5 and 2-6 for complete dimensional information.

2.7 SINGLE CHANNEL CHART TAKE-UP, MODEL 11-6402-08

Refer to drawing 682998 for installing this chart take-up on single channel recorders.

2.8 DUAL CHANNEL CHART TAKE-UP, MODEL 11-6402-09

Refer to drawing 283104 for installing this chart take-up on the dual channel recorders.

2.9 EVENT MARKER KITS, INSTALLATION

Refer to drawing 682862 for installing the right event marker kit (Model 11-6222-03 available for dual channel units only.) and left event marker (Model 11-6222-04) on either the low profile or vertical recorders.

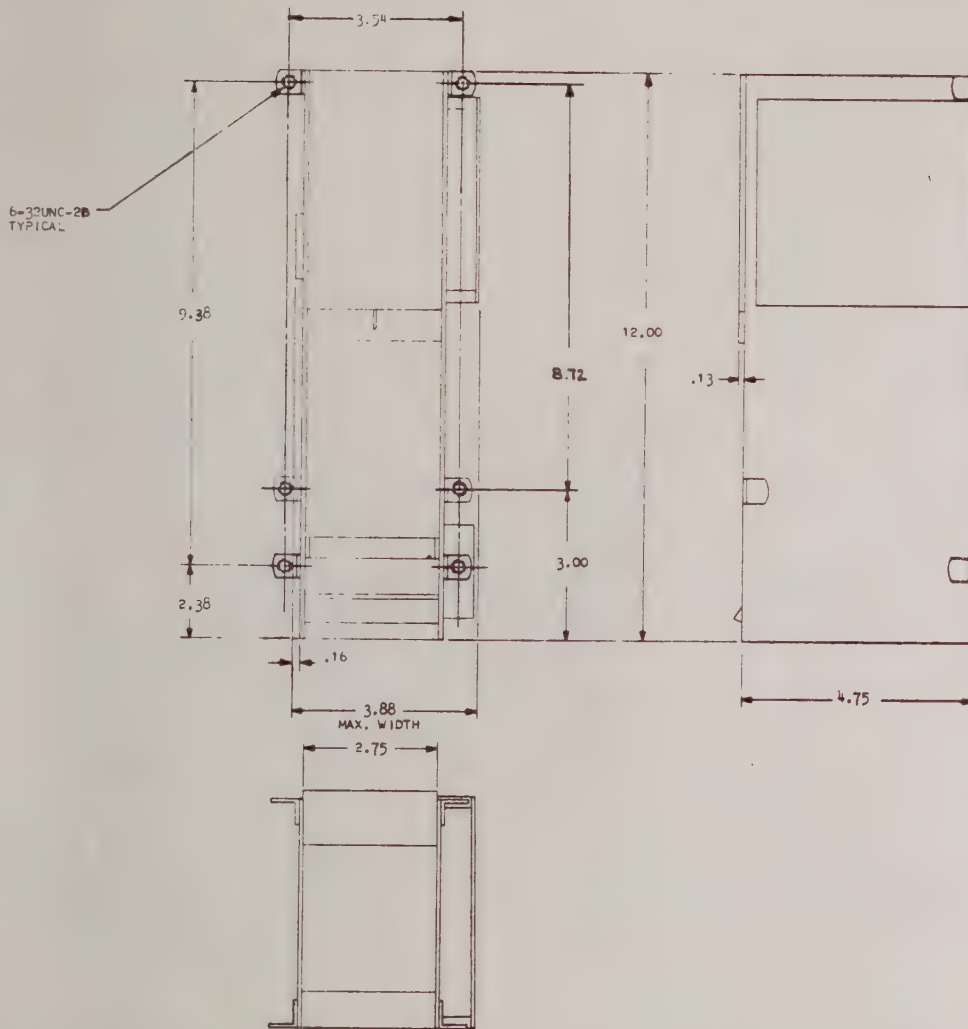


FIGURE 2-3 OUTLINE DIMENSIONS FOR SINGLE CHANNEL, LOW-PROFILE RECORDER

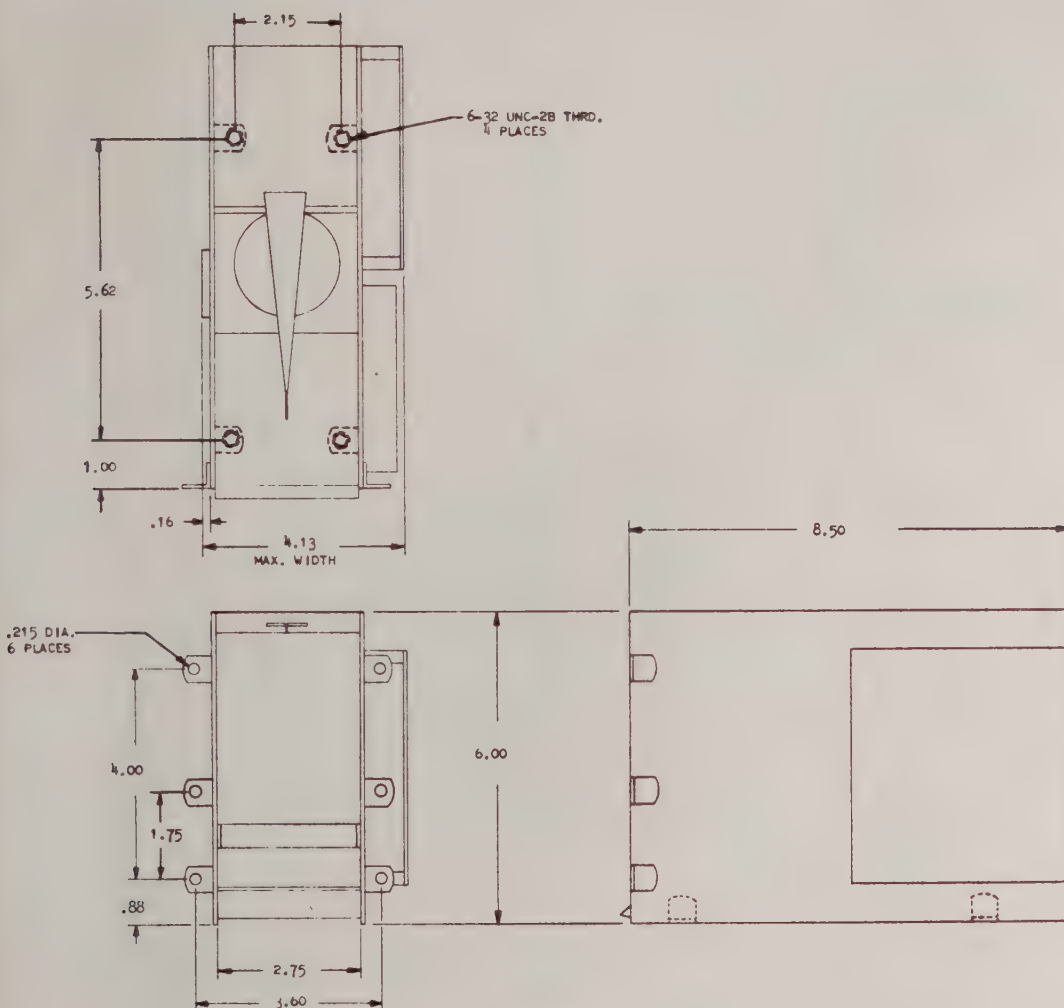
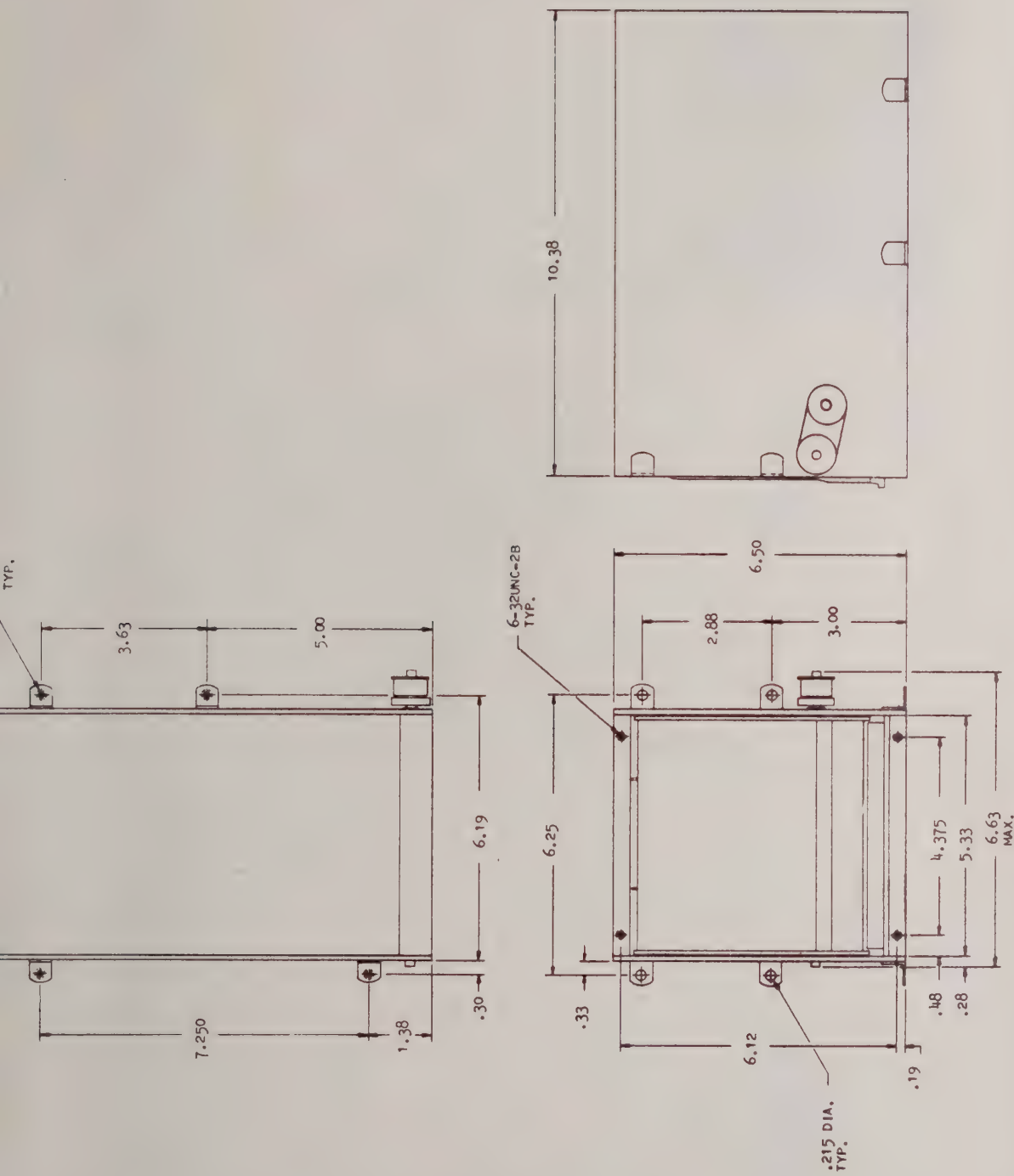
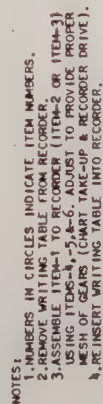
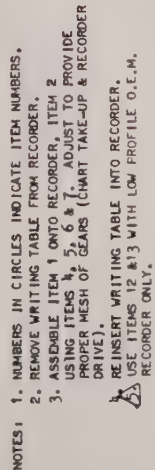
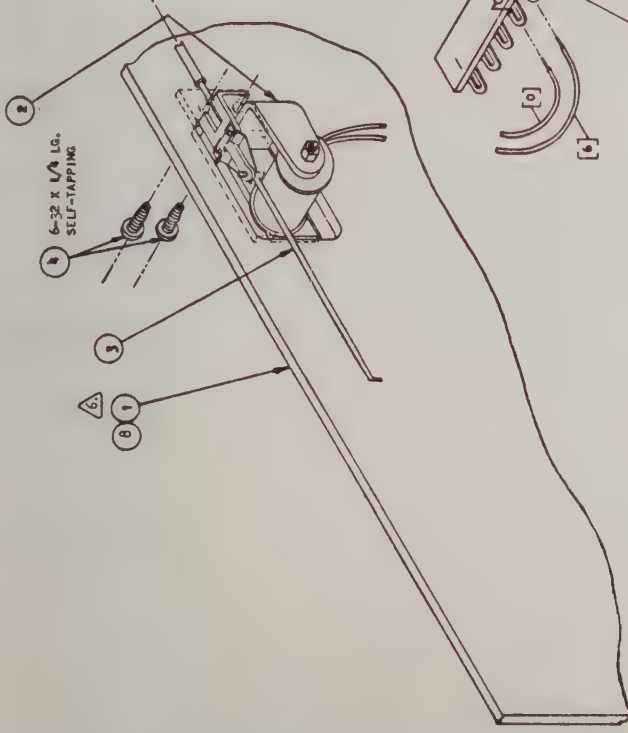
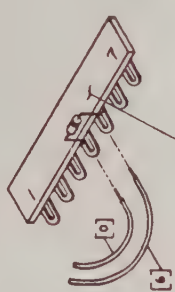
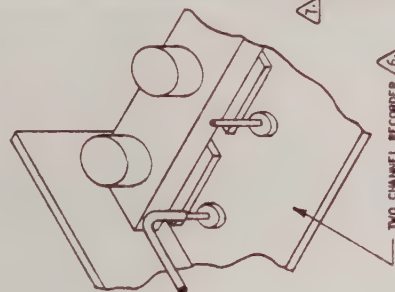
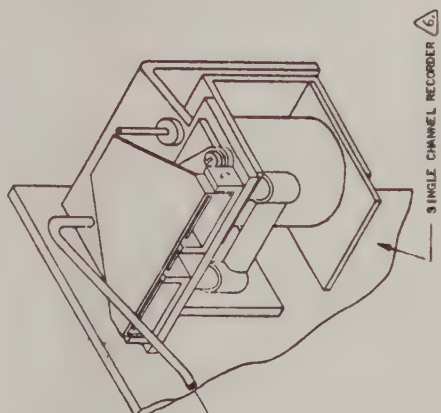


FIGURE 2-4 OUTLINE DIMENSIONS FOR SINGLE CHANNEL VERTICAL RECORDER



[illegible]

[illegible]



- NOTES:
1. NUMBERS IN CIRCLES INDICATE ITEM NUMBERS.
 2. WIRE COLORS IN EIA COLOR CODE SHOWN IN BRACKETS.
 3. MOUNT ITEM 2 TO LEFT HAND SIDE PLATE OF ITEM 1 USING ITEM 6.
 4. CONNECT LEADS OF ITEM 2 (SOLDER) TO TERMINALS 1 & 5 AS SHOWN.
 5. CONNECT INK TUBE AS SHOWN.
 6. LEFT HAND INSTALLATION SHOWN. RIGHT HAND IS MIRROR IMAGE.
 7. PER CUSTOMER ORDER.

NO.	BRUSH PART NO.	DESCRIPTION	QUANTITY
9	11-6222-03	V.I. ASSY, EVENT MKR, R.H.	1
8	XXXX-6827-00	RECORDER, 2 CHANNEL	-
7	682842	SHIP. LIST & INSTALL. INST	1
6	222640	C-ROD, CONCEALED DAMAGE	1
5	340273-1	BA3, PLASTIC	1
4	31-262716-6204	SCREW, SELF-TAPPING	2
3	11-2673-20	PEN ASSY., EVENT - INK	1
2	11-6222-08	KIT ASSY., E.M.-L.H.	1
1	XXXX-6817-00	RECORDER, SINGLE CHANNEL	-
SUM			1

SHIPPING LIST & INSTALLATION INSTRUCTIONS

QUANT. 1

DATE 10-20-1971

BY 100

98795

682862

SECTION III

SERVICING

3.1 GENERAL

This section describes and illustrates chart paper loading. This procedure can be quickly and easily performed by the operator.

3.2 CHANGING CHART PAPER

1. Turn unit off.
2. Release writing table by depressing latching bar. Remove table from recorder.

NOTE: Refer to Figure 3-1.

3. Depress both plungers on sides of writing table and remove empty chart paper core.
4. Slide new chart paper roll on to spool, and insert spool into writing table.
5. Feed the paper over the top of the writing surface, and behind pressure roll.

NOTE: See Figure 3-2.

6. Replace writing table and snap into place.
7. Operate recorder and run out one or two feet of chart paper to align paper.
8. Stop recorder.
9. Unit is ready for use.

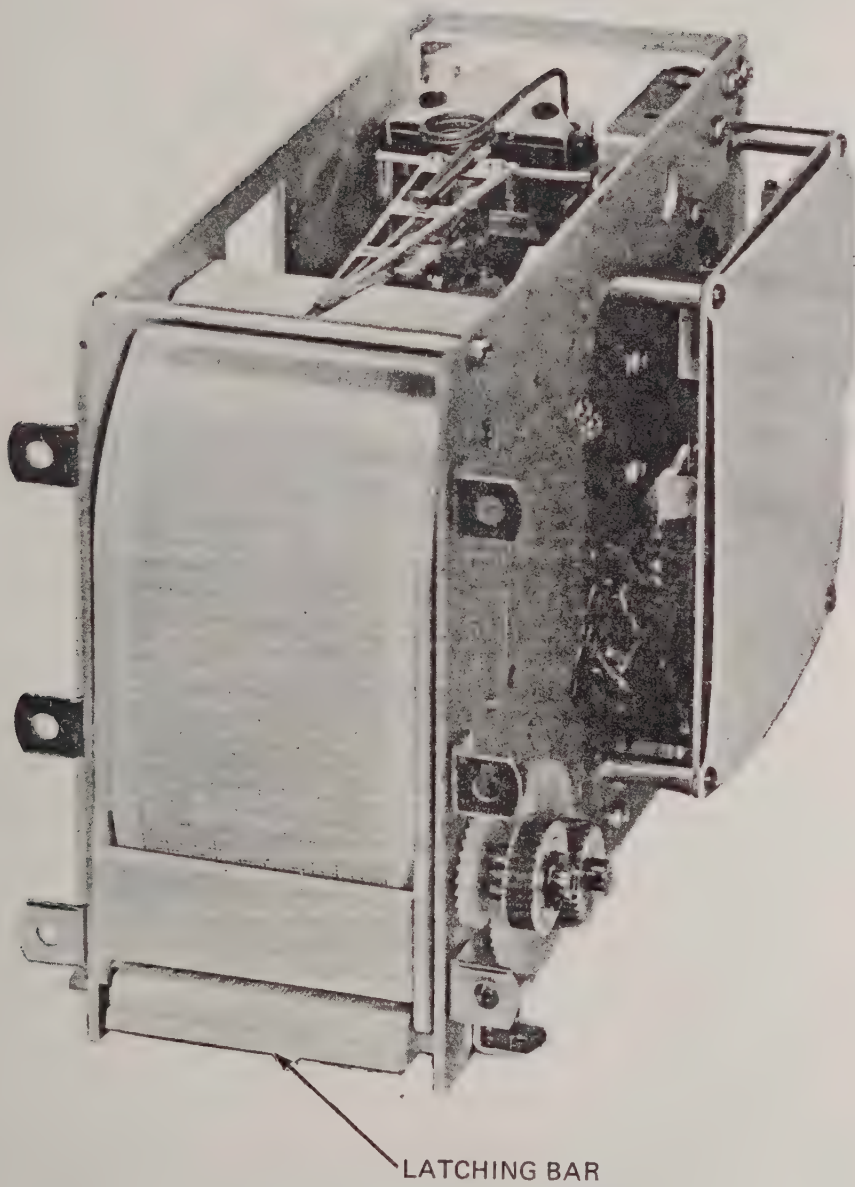


FIGURE 3-1 CHART PAPER LOADING

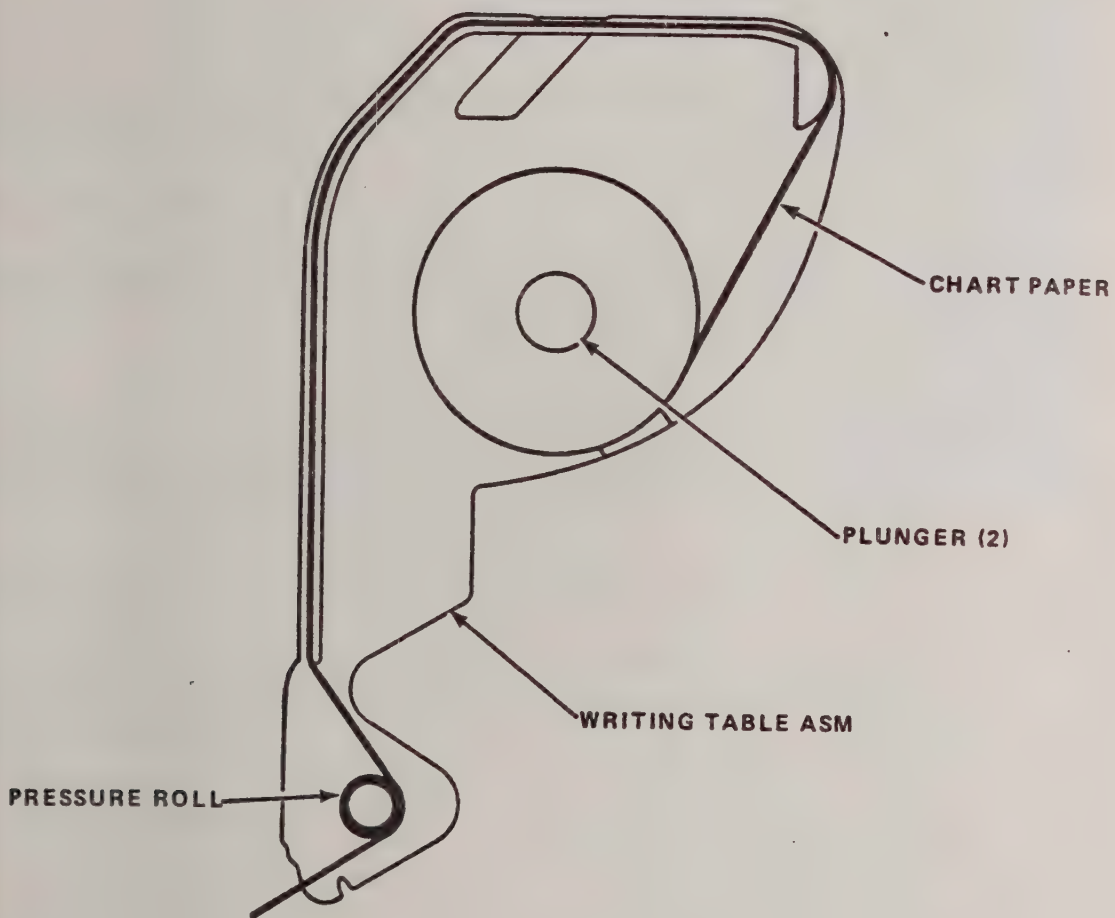


FIGURE 3-2 CHART PAPER THREADING DIAGRAM

SECTION IV

MAINTENANCE

GENERAL

This section describes and illustrates routine maintenance procedures that can easily be performed by a qualified service technician.

REPLACING ANALOG PEN

This paragraph describes and illustrates removal and installation of the analog pen.

Removal

NOTE: Refer to Figure 4-1.

Disconnect power and signal inputs.

On Low Profile units, remove top cover.

Gently remove pen ink tube from manifold nipple. (See Figure 4-1)

Use pen replacement wrench (Brush part number 1-120922-2) and loosen set screw one-half turn through access hole in side of penmotor drive arm shaft, and remove wrench. (see Figure 4-2)

NOTE: Do not loosen set screw more than one-half turn or pen cannot be removed from

Remove pen.

Installation

Carefully slide replacement pen onto penmotor drive arm shaft.

Align screw in pen hub with access hole in drive arm shaft and "snug-up" set screw using pen replacement wrench (Brush part number 1-120922-2). Remove wrench.

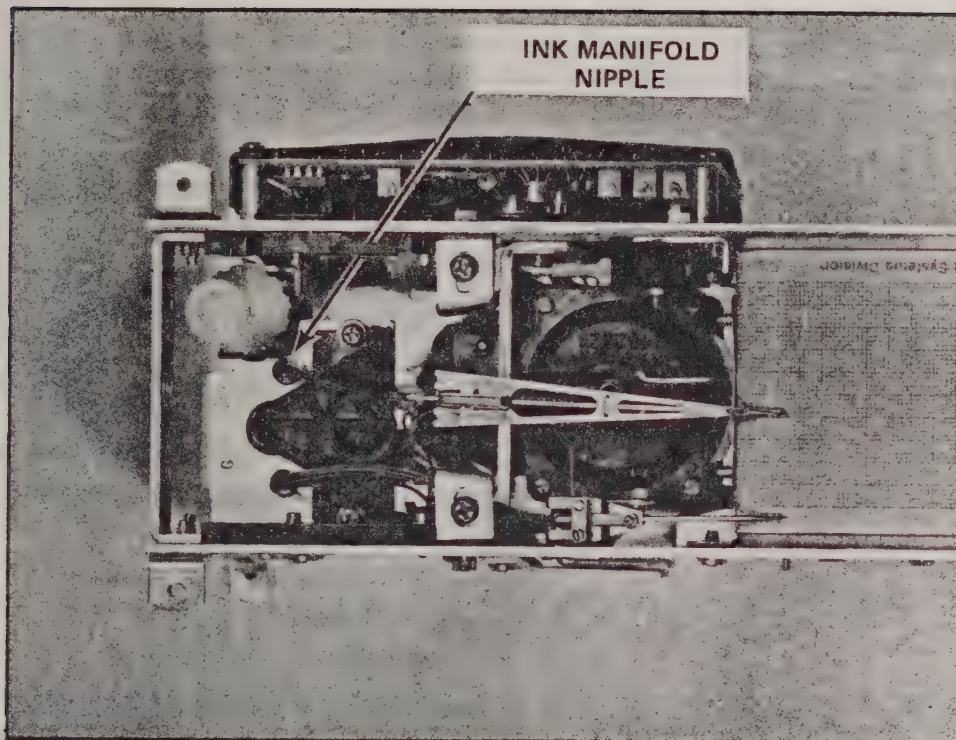


FIGURE 4-1 REPLACING ANALOG PEN (1 of 2)

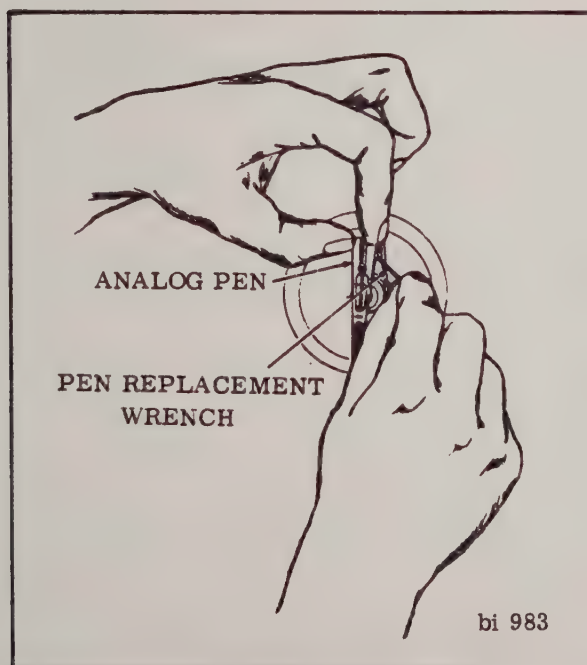


FIGURE 4-2 REPLACING ANALOG PEN (2 of 2)

NOTE: Set screw should be tight to create friction, but loose enough to allow the pen to be rotated in the penmotor hub.

3. Connect ink tube between pen and manifold nipple.
4. Manually depress ink manifold control bar and lift pen slightly to allow ink to bleed through pen tip.
5. Gently grasp pen near hub and move pen across entire chart width (50mm).
6. If ink trace is not parallel to a horizontal time line, gently turn the pen in the penmotor drive arm until trace is parallel to time line.
7. Tighten set screw securing pen in penmotor drive arm shaft and remove wrench.
8. Reconnect power and signal inputs.
9. A new pen must be lapped before proceeding. Carefully raise pen tip just enough to slide a small strip of emery paper (3M wet or dry Tri-M-ite paper, Grit M600, Brush part number 669234) under pen tip.
10. Holding emery paper firmly, move pen back and forth five or six times.

CAUTION: MAKE SURE THAT EMERY PAPER IS HELD FLAT AGAINST THE CHART PAPER TO INSURE PROPER LAPPING OF PEN.

11. Remove emery paper and operate recorder.
12. Check for dryness by wiping dry index finger with moderate pressure, across trace approximately one inch below pen. If trace does not smear, pen is properly lapped.
13. If ink trace smears, refer to Para. 4.6, pen lapping.
14. Check pen pressure as described in Para. 4.5.
15. On Low-Profile units, install top cover.
16. Recorder is ready for operation.

4.3 REPLACING EVENT PEN

This paragraph describes and illustrates removal and installation of the event marker pen.

a. Removal

1. Disconnect power and signal inputs.
2. On Low-Profile units, remove top cover
3. Gently remove from manifold nipple, ink tube of pen to be replaced.
4. Loosen two adjustment screws attaching pen to event marker and remove pen from event marker.

b. Installation

1. Slide replacement pen onto event marker and align pen tip on vertical grid line and on same time lines as analog pen.
2. Tighten two screws attaching pen to event marker.
3. Manually depress ink manifold control bar and lift pen slightly to allow ink to bleed through pen tip.
4. Reconnect power and signal inputs.
5. A new pen must be lapped before proceeding. Carefully raise pen tip just enough to slide a small strip of emery paper (3M wet or dry Tri-M-ite paper, Grit M600, Brush part number 669234) under pen tip.
6. Carefully move lapping paper in and out five or six times.

CAUTION: MAKE SURE THAT EMERY PAPER IS HELD FLAT AGAINST CHART TO INSURE PROPER LAPPING OF PEN.

7. Remove emery paper and operate recorder.
8. Check pen for dryness by wiping dry index finger with moderate pressure, across trace approximately one inch below pen. If trace does not smear, pen is properly lapped.
9. If ink trace smears, refer to Para. 4.6 Pen Lapping.
10. Check pen pressure as described in Para. 4.5.
11. On Low-Profile units, install top cover.

12. Recorder is ready for operation.

4.4 REPLACING PENMOTOR BAND ASSEMBLY

NOTE: The drive arm assembly is a critically adjusted part of the penmotor. If drive arm is broken or damaged in any way, replacement should be effected only by an authorized Brush Service Representative.

The penmotor band assembly (Brush part number 682143 for low-profile, part number 682145 for vertical) should not be removed unless broken. Because the band tension is critical, a band replacement tool (part number 341409-915) must be used to replace band assembly.

NOTE: Penmotor need not be removed from recorder.

1. Remove analog pen (Para. 4.2).
2. Remove socket-head screw and band clamping (curved) washer that secures band assembly to drive arm (use wrench 1-120922-3). (see Figure 4-3)
3. Remove two socket-head screws and lock washers securing band assembly to drive arm bracket (use wrench 245218-5). Discard damaged band assembly.

CAUTION: TO PREVENT DAMAGE TO THE NEW BAND ASSEMBLY, CHECK TO BE SURE DRIVE ARM AND BRACKET ARE FREE OF NICKS, DIRT, INK BEFORE INSTALLING NEW BAND ASSEMBLY.

4. Position new band assembly around drive arm hub and install band clamping washer and socket-head screw. Do not tighten screw.

NOTE: Check to be sure curved portion of washer is positioned to conform to the radius of the drive arm hub. Use care not to nick or scratch band assembly.

5. Align band assembly mounting holes with tapped holes in drive arm bracket and install two screws and lock washers. Do not tighten screws.
6. Inspect band for proper positioning around drive arm hub so that equal pressure is maintained on top and bottom of band assembly.
7. Install band tool on penmotor and thread knurled thumb screw into drive arm bracket.

NOTE: Refer to Figure 4-4.

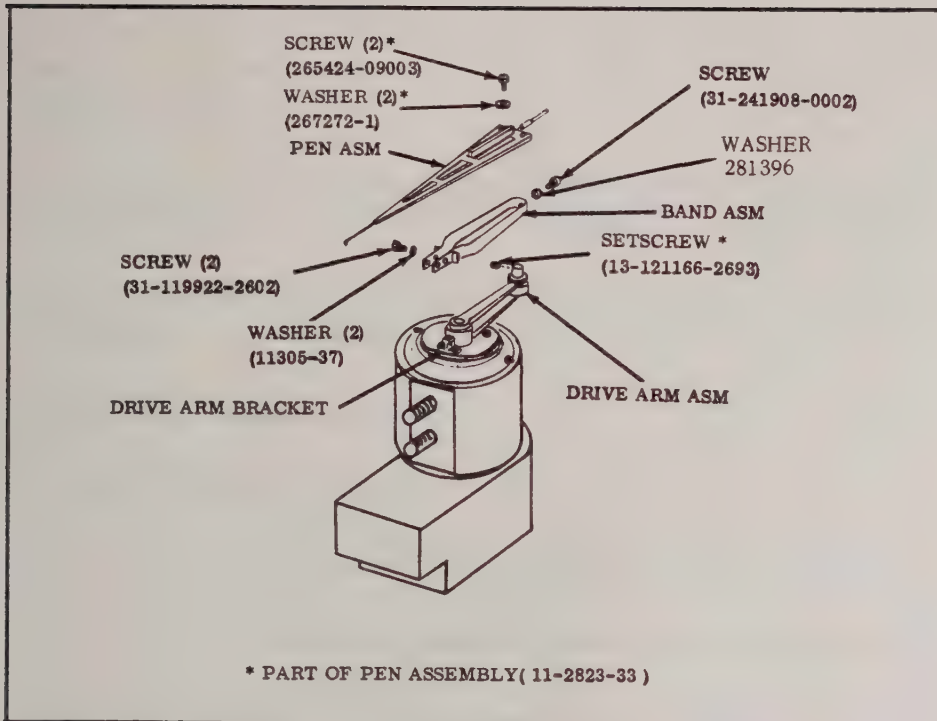


FIGURE 4-3 PENMOTOR ASSEMBLY

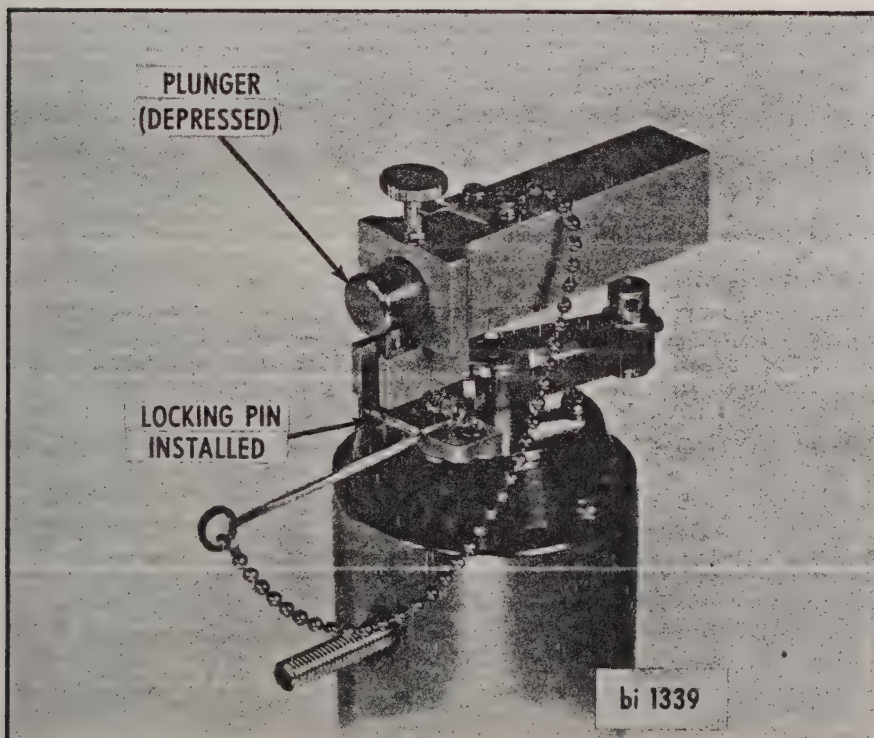


FIGURE 4-4 BAND TOOL MOUNTING

8. Depress plunger and insert locking pin into two small holes of band assembly, making certain plunger is behind locking pin.
9. Tighten two screws in drive arm bracket, loosen one quarter-turn, move drive arm back and forth several times to center band assembly and tighten the two drive arm bracket screws.
10. Move drive arm back and forth several times to center band assembly on drive arm and tighten socket-head screw securing band assembly to drive arm.

NOTE: Do not tighten more than 16 inch-ounces.

11. Depress plunger and remove locking pin.
12. Loosen knurled screw securing band tool to drive arm bracket and remove tool.
13. Apply glyptal cement (or equivalent) to heads of the three screws to prevent working out.
14. Install analog pen (Para. 4.2).

4.5 PEN PRESSURE MEASUREMENT AND ADJUSTMENT

Analog or event marker pen pressure should be checked if the ink trace is excessively wide (bleeding), indicating low pen pressure or if pen gouges the chart paper, indicating excessive pen pressure.

NOTE: Wide trace may also indicate an improperly lapped pen. Refer to Paragraph 4.6 for pen lapping procedures.

The gram gage (part number 240601-910) is used to measure the pressure of the analog and event marker pen as follows:

1. Operate recorder.

NOTE: Refer to Figure 4-5 and 4-6.

2. Place gram gage hook under pen shaft as close as possible to tip and form a right angle to pen shaft with gage hook.

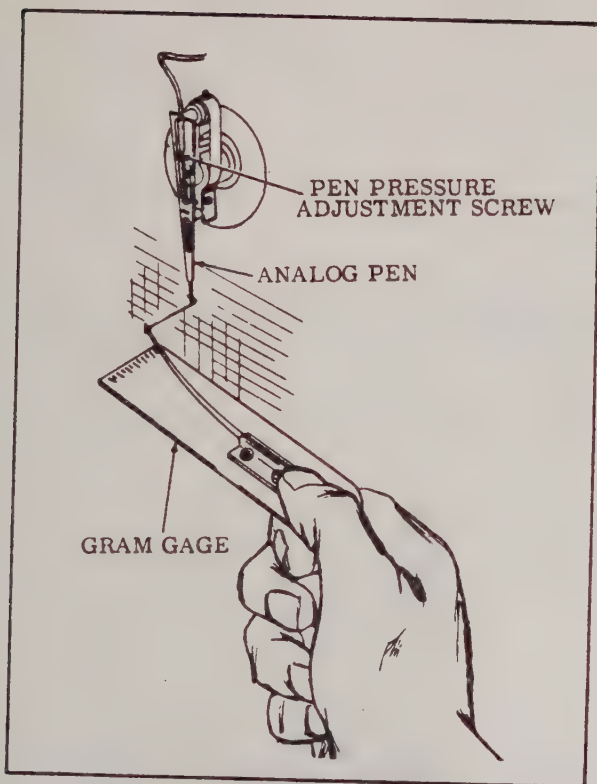


FIGURE 4-5 PEN PRESSURE MEASUREMENT

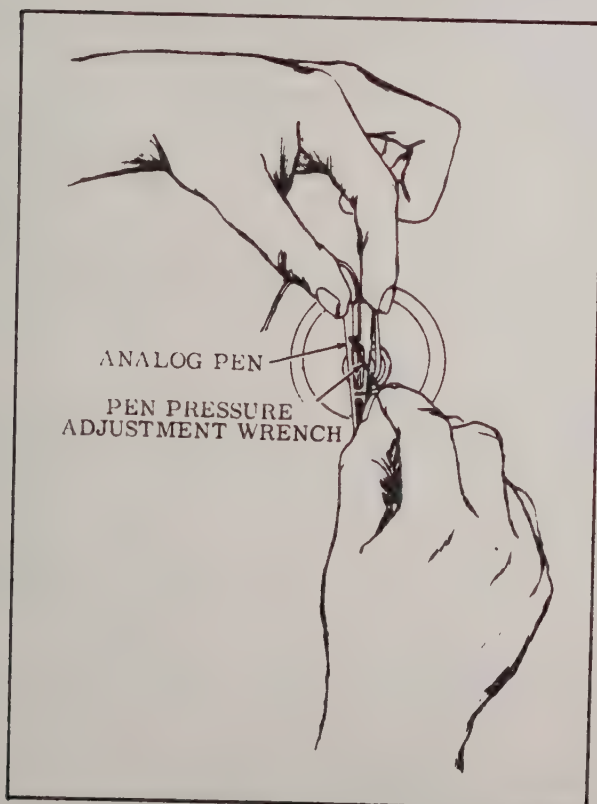


FIGURE 4-6 PEN PRESSURE ADJUSTMENT

3. Pull pen from chart and take reading on gage the moment excessive ink starts to flow from pen.
4. Proper writing pressure for analog pen is 28 to 32 grams. Event marker pen pressure is 20 to 25 grams.
5. Use pen pressure adjustment wrench (part number 1-120922-18) and turn adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure.
6. Check pen pressure with gram gage and continue adjustment until proper reading is obtained.
7. When pen pressure is correct, turn recorder OFF.

4.6 PEN LAPPING

4.6.1 General

This paragraph describes and illustrates the proper procedures for lapping the analog and event pens. Intermittent or "wet" ink trace are indications that pen pressure is incorrect or that pen requires lapping. Check for "wet" writing by operating the recorder (no signal applied). Check pen trace by wiping index finger, with moderate pressure, across trace approximately one inch below pen tip. If ink does not smear, pen is properly lapped. If trace smears, check and adjust pen pressure (Para. 4.5). Repeat test, and if trace continues to smear, lapping is required.

4.6.2 Lapping Procedures.

NOTE: Lapping of pens should only be done when required.

Carefully raise pen tip just enough to slide a small strip of emery paper (4/0) under pen tip (Paper is Brush Pt. No. 141119) (see Figure 4-7)

CAUTION: DO NOT USE A COARSE OR VERY ABRASIVE TYPE OF EMERY PAPER. USE ONLY THE GRADE SPECIFIED.

Holding emery paper firmly, move pen back and forth five or six times.

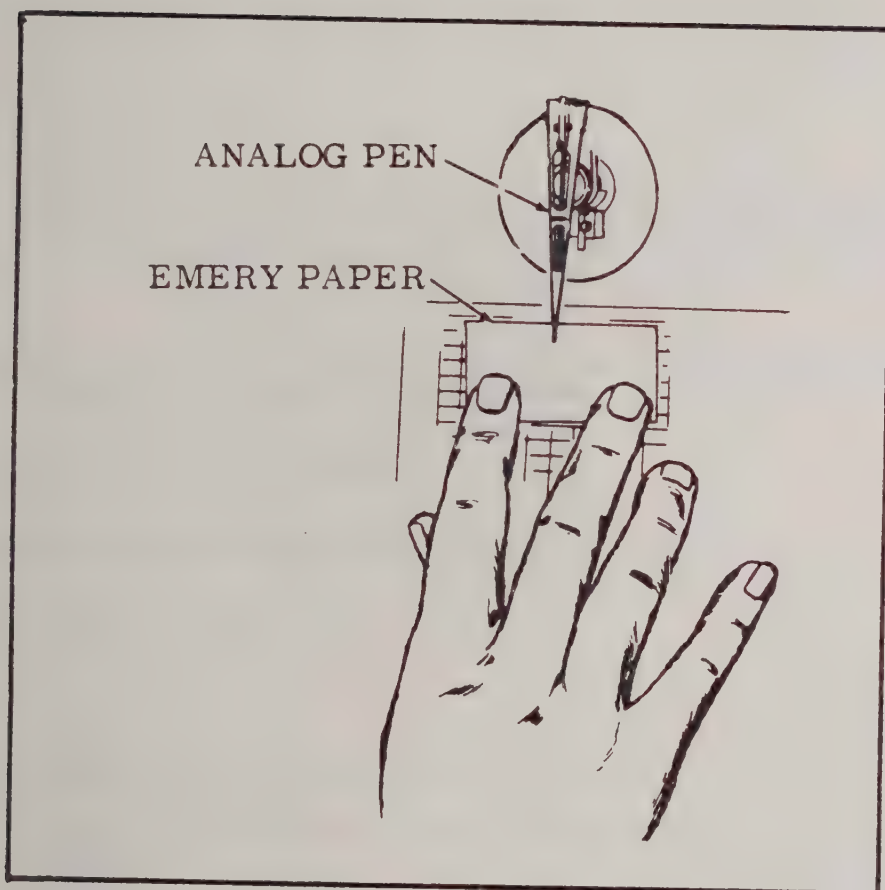


FIGURE 4-7 PEN LAPPING

CAUTION: MAKE SURE THAT EMERY PAPER IS HELD FLAT AGAINST THE CHART PAPER TO INSURE PROPER LAPPING OF PEN.

3. Remove emery paper and operate recorder.
4. Check pen for dryness by wiping dry index finger with moderate pressure, across trace approximately one inch below pen. If trace does not smear, pen is properly lapped.
5. Repeat steps 1 thru 4 as required to obtain dry trace.
6. If pen tip should become blocked during lapping operation, touch pen at top of pen (above tip) with a hot soldering iron for a few seconds with the pen tip raised slightly off the paper. This will usually start ink flowing and flush out abrasive.

NOTE: If procedure is repeated more than three times, recheck pen pressure and repeat lapping. Strict adherence to above lapping procedures is imperative.

7. When dry trace is achieved, turn recorder off.

4.7 INK CARTRIDGE REPLACEMENT, SINGLE CHANNEL RECORDERS

NOTE: Refer to Figures 4-8 thru 4-11.

Removal

Tighten pressure activating screw into ink cartridge until snug.

Relieve pressure on ink cartridge by turning locking nut clockwise to withdraw pressure activating screw.

NOTE: Withdrawing the pressure activating screw approximately 1/4 inch from its previous operating position is sufficient to relieve pressure.

Slide entire ink cartridge out of its mounting base. Discard empty cartridge.

Installation

Remove shipping cap from ink cartridge.

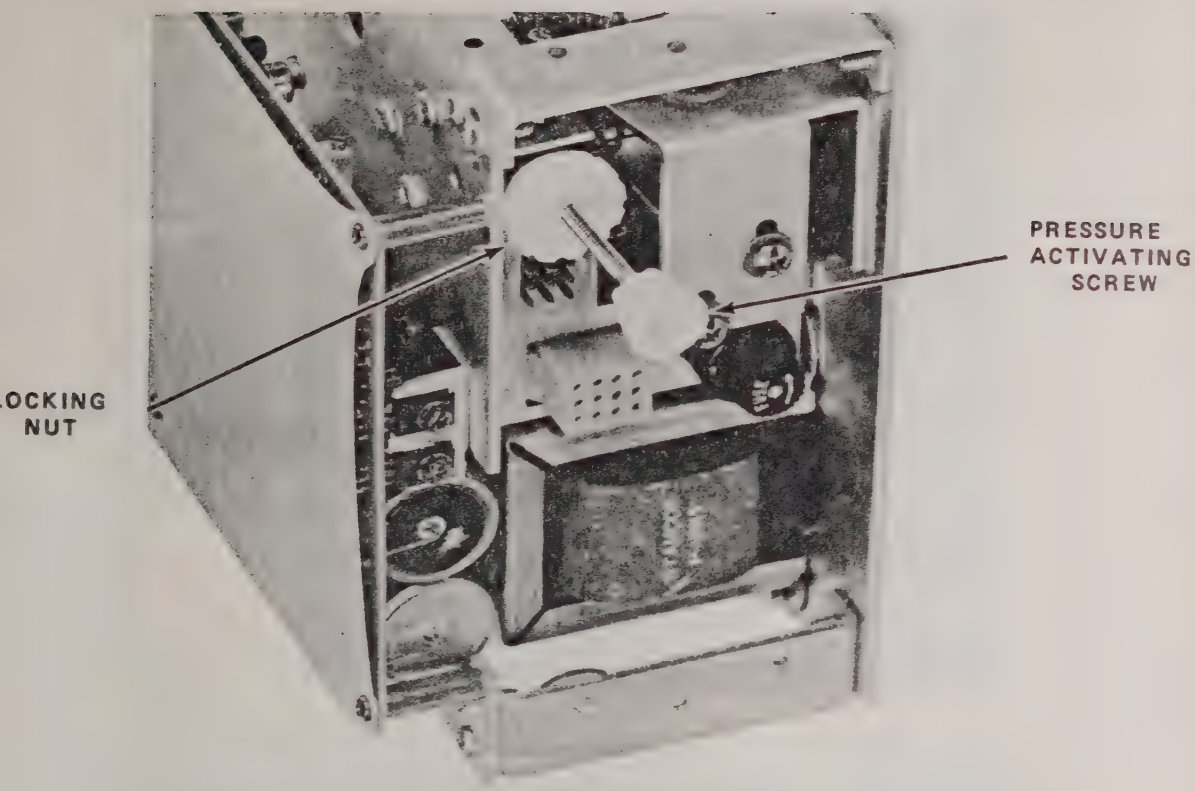


FIGURE 4-8 REPLACING INK CARTRIDGE – VERTICAL RECORDER

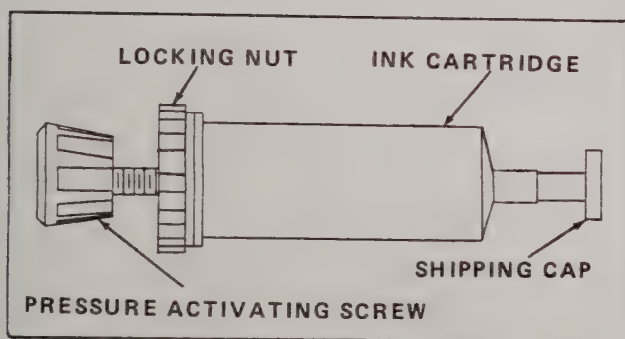


FIGURE 4-9 INK CARTRIDGE, MODEL 11-2735-04

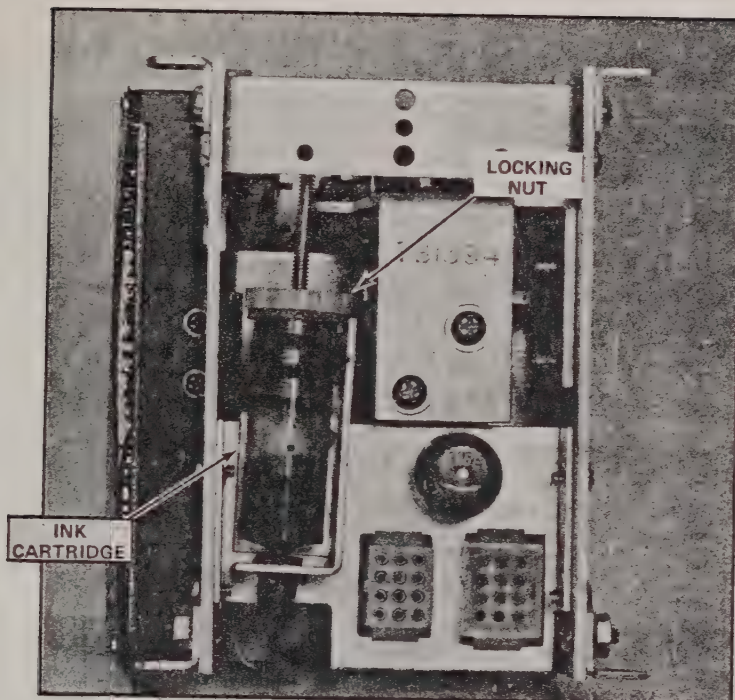


Figure 4-10 Replacing Ink Cartridge — Low Profile Recorder (1 of 2)

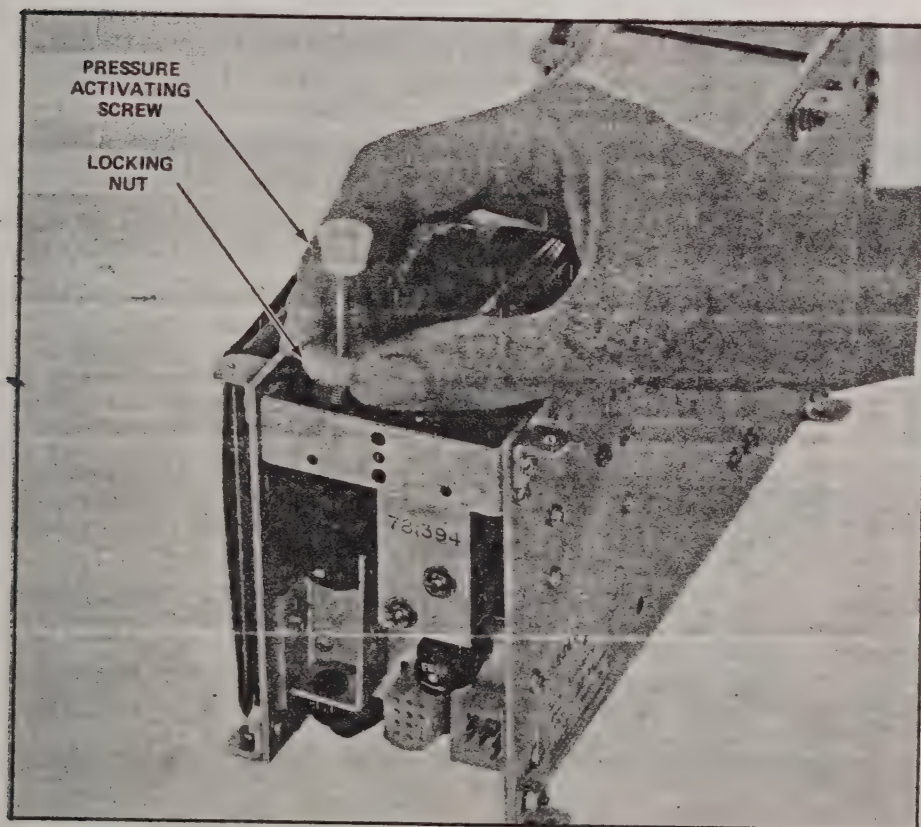


Figure 4-11 Replacing Ink Cartridge — Low Profile Recorder (2 of 2)

2. Install new ink cartridge by sliding cartridge into mounting base. Make sure ink cartridge is firmly seated.
3. Pressurize ink system by screwing locking nut counterclockwise until locking nut is in contact with pressure activating screw.
4. Remove pressure activating screw assembly from ink cartridge and thread into storage location.
5. Recorder is ready for use.

4.8 INK CARTRIDGE REPLACEMENT, DUAL CHANNEL RECORDERS

NOTE: Refer to Figures 4-12 and 4-13.

a. Removal

1. Remove entire ink cartridge assembly by depressing release post and sliding assembly clear of recorder.
2. Hold ink cartridge assembly securely, and rotate activating screw clockwise until snug to relieve pressure and stop ink flow.
3. Remove ink tube from nipple on end of ink cartridge.
4. Unscrew ink cartridge chamber from plunger assembly and discard cartridge. (see Figure 4-13)

b. Installation

1. Remove plastic piston retainer ring from replacement cartridge and discard retainer.
2. Install ink cartridge on plunger assembly and tighten securely.
3. Remove shipping cap from ink cartridge and discard shipping cap.
4. Install ink tube on cartridge.

NOTE: Do not use tweezers or other sharp instruments to install tubing.

5. Turn activating screw counterclockwise until snug to pressurize ink system.
6. Install ink cartridge in recorder by snapping entire assembly into the mounting clip.
7. Recorder is ready for use.

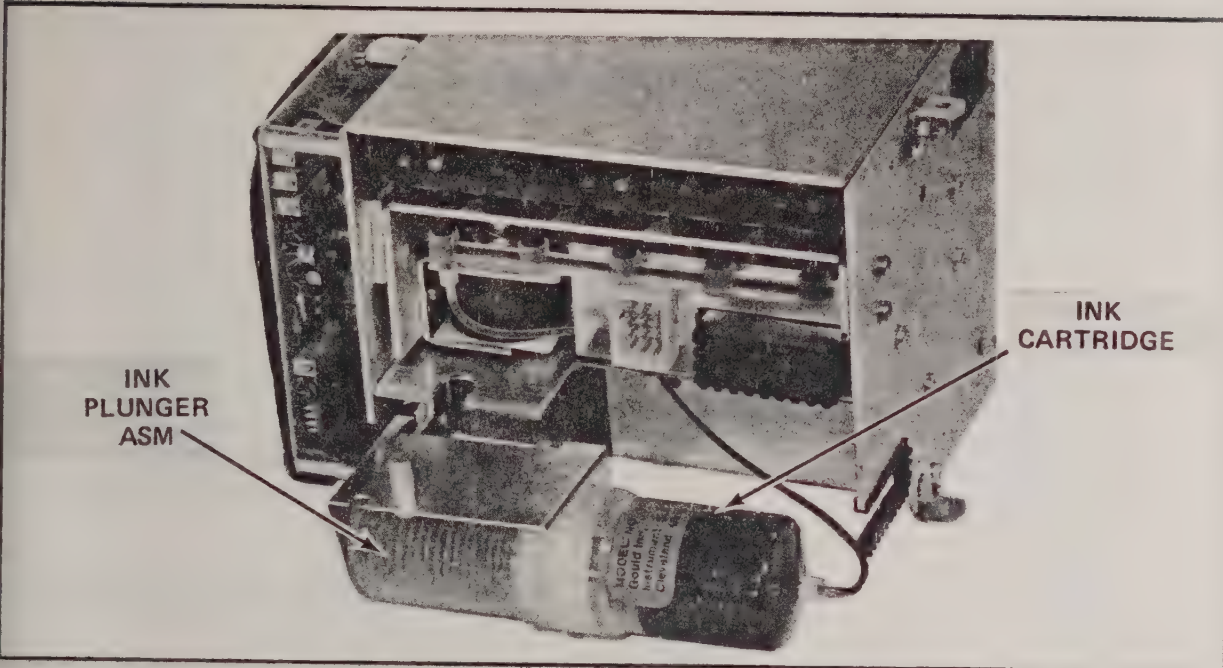
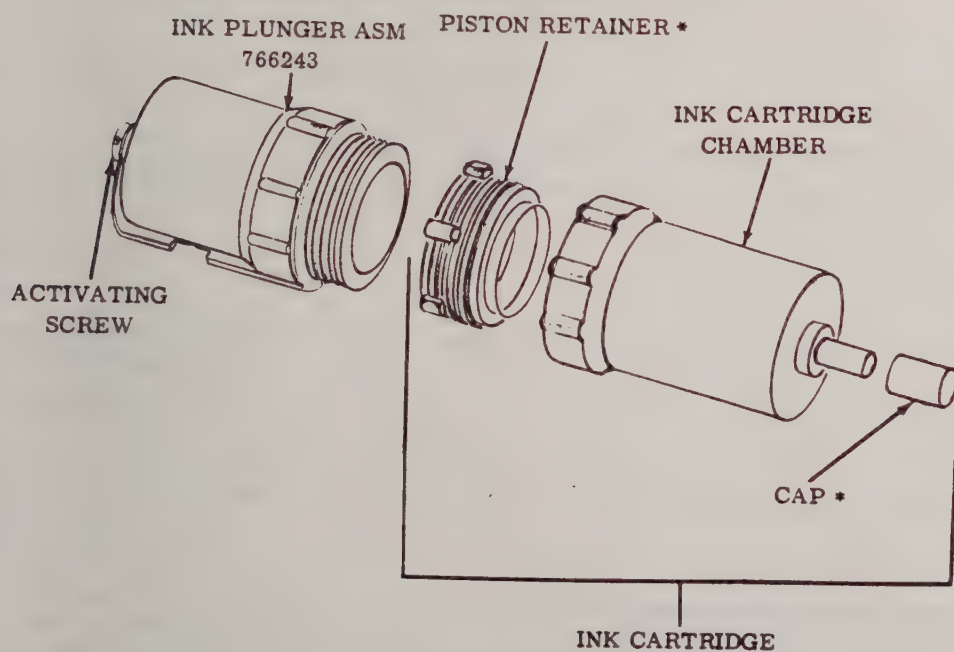


FIGURE 4-12 REPLACING INK CARTRIDGE – LOW-PROFILE RECORDER



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* SHIPPING ITEMS - TO BE DISCARDED

FIGURE 4-13 INK CARTRIDGE MODEL 11-2730-01

SECTION V

CALIBRATION

5.1 GENERAL

The Brush Modular recorder has been factory calibrated, and under normal conditions will not require calibration. However, because of parts replacement or repair, calibration may be necessary. This section describes and illustrates the correct calibration procedures. It should be pointed out that calibration should only be performed by qualified personnel familiar with procedures and standards.

5.2 TEST EQUIPMENT REQUIRED

The following is a list of recommended test equipment necessary for calibration.

NOTE: Specific manufacturer need not be adhered to, but comparable equipment is mandatory to insure calibration accuracy.

Function Generator (Hewlett-Packard, Model 202A, or equivalent).

D. C. Power Supply, 0 to 5 volts $\pm .05\%$ floating.

NOTE: A precision voltmeter (Fluke 883A or equivalent) may be used to monitor D.C. Power Supply to insure accuracy if a precision D. C. Power Supply is not available.

5.3 PROCEDURES

Refer to Figure 5-1 (single-channel) and Figure 5-2 (dual-channel) for all connections and control locations.

Rotate limit span resistor R-146 full clockwise.

Mechanically center damping resistor R-126, gain resistor, R-104, and limit center resistor R-112.

NOTE: Resistors R-104, R-112, and R-126 are 10 turn potentiometers without mechanical stops. To center resistors, turn shaft clockwise approximately 12 to 15 turns then counter-clockwise approximately 5 turns.

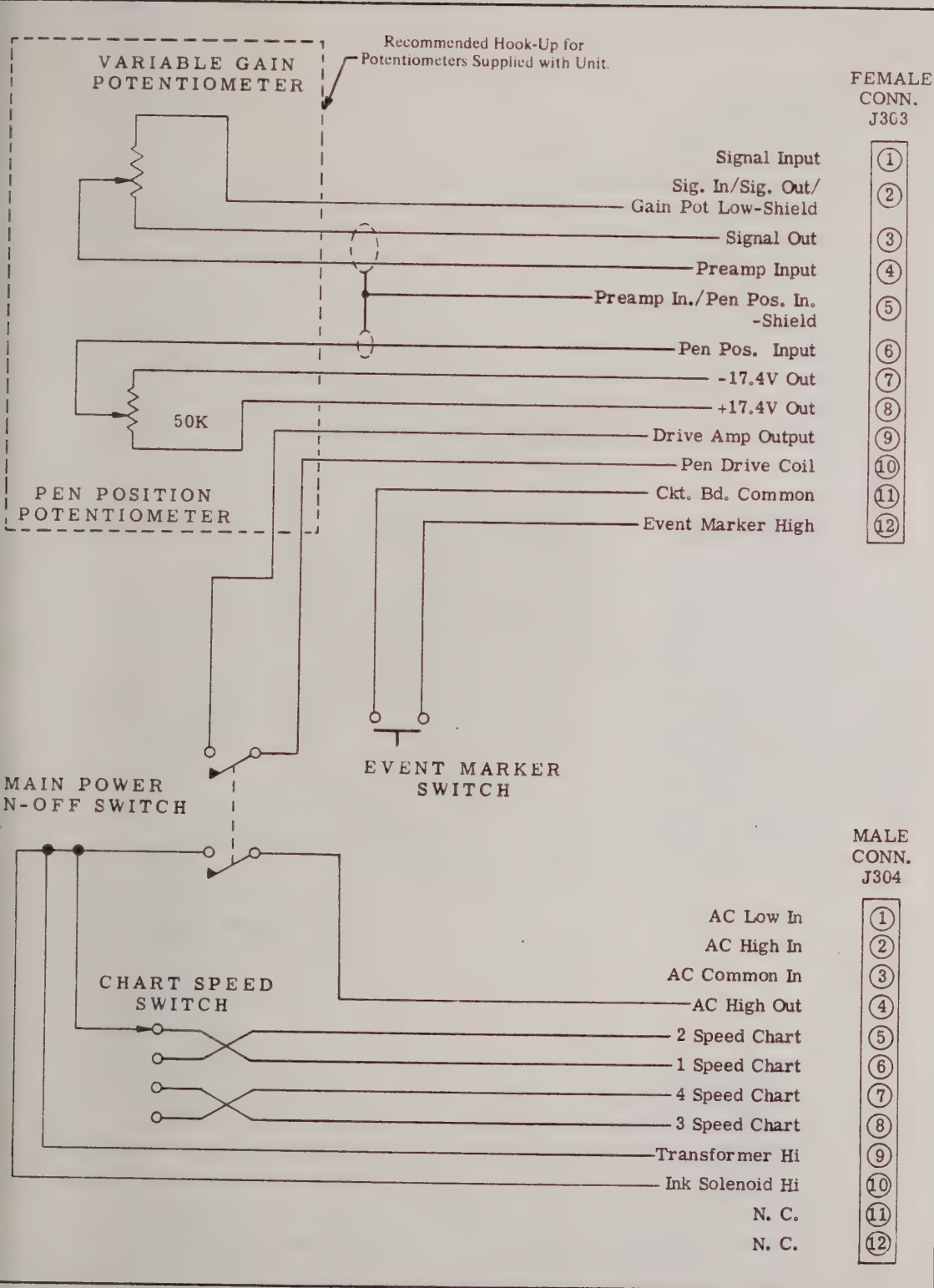
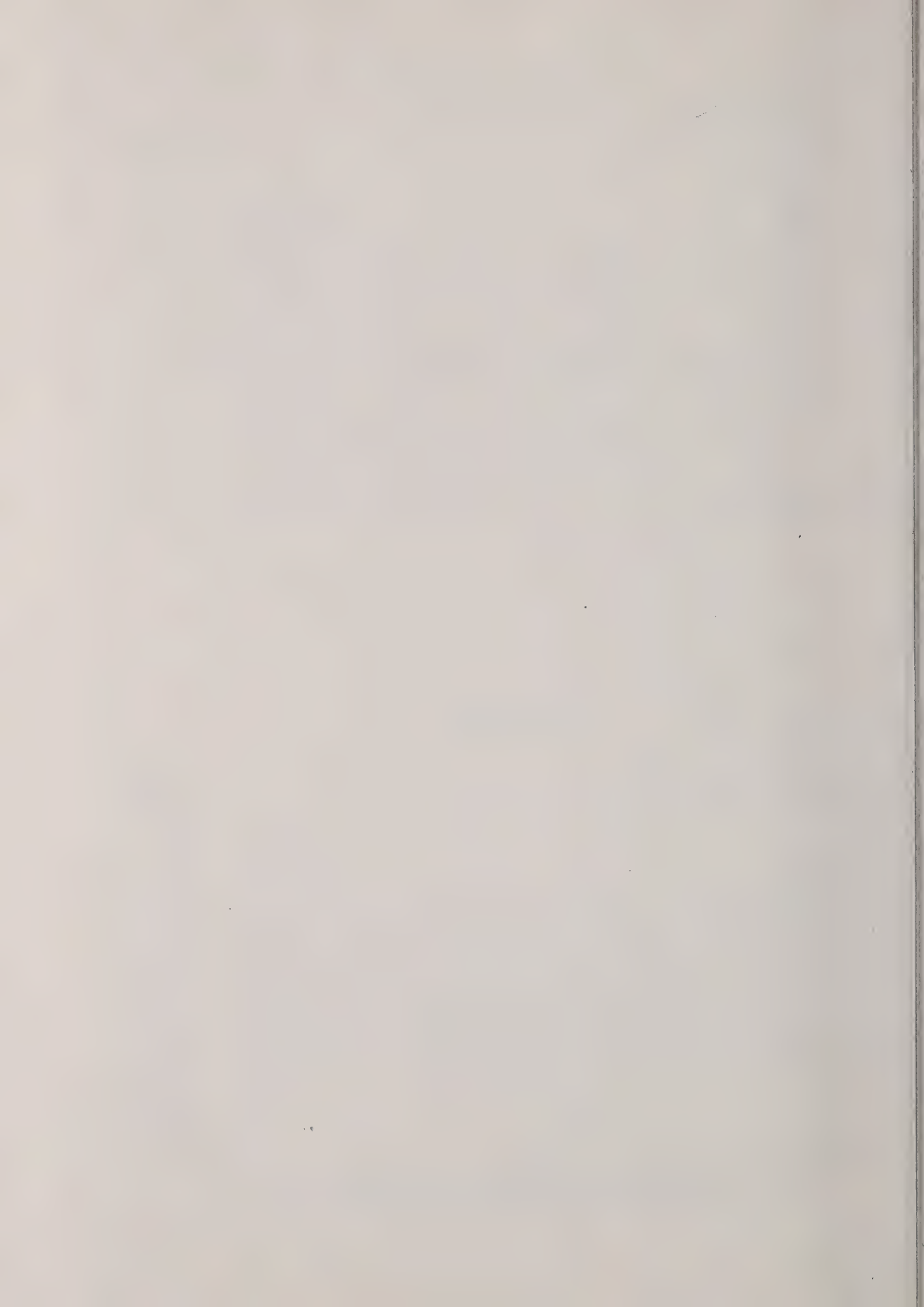


FIGURE 5-1 SINGLE CHANNEL RECORDER SUGGESTED POWER, SPEED CONTROL, CALIBRATION CONTROL AND INPUT SIGNAL CONNECTIONS.



FEMALE
CONN.
J303

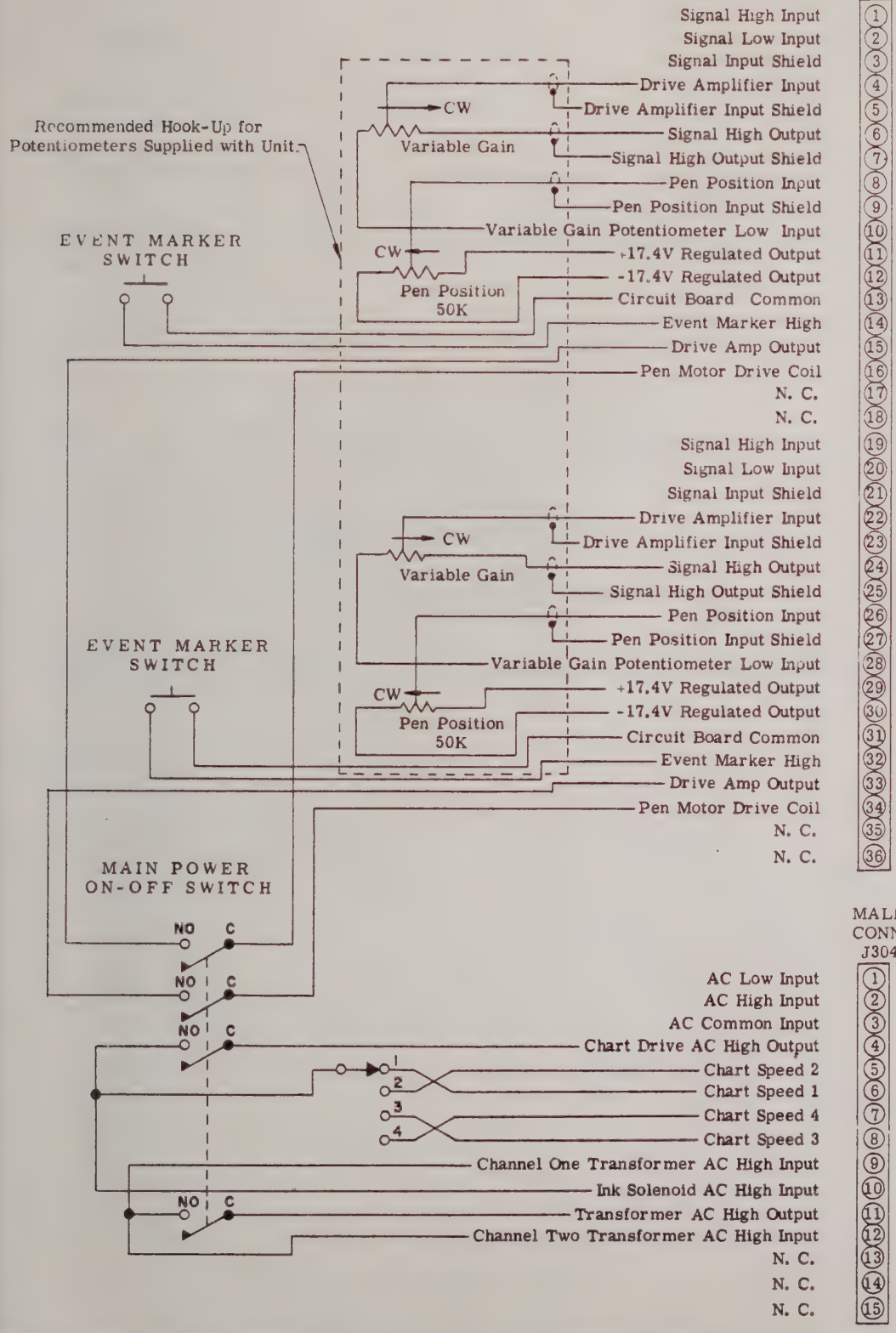


FIGURE 5-2 DUAL CHANNEL RECORDER SUGGESTED POWER, SPEED CONTROL, CALIBRATION CONTROL AND INPUT SIGNAL CONNECTIONS.

4. Mechanically center pen position potentiometer.
5. Apply power and allow 15 minutes warm up.
6. Adjust limit center resistor R-112 to center pen on chart.
7. Apply a 10Hz sine wave with a peak-to-peak amplitude of twice the rated full scale sensitivity to inputs.
8. Adjust limit center resistor R-112 for a chart trace that is symmetrical about chart center.
9. Adjust limit span resistor R-146 for a chart trace of 1.5 divisions over scale on each side of chart.
10. Repeat steps 8 and 9 as necessary to obtain proper limit span and centering.
11. Apply a 10Hz sine wave of exactly full scale peak-to-peak amplitude to inputs.
12. Increase frequency to 30Hz keeping exactly the same peak-to-peak input amplitude as in step 11 to inputs.
13. Adjust damping resistor R-126 for exactly full scale chart trace.
14. Remove input signal.

15. Adjust pen position to place pen on right chart edge.
16. Apply $+5 \pm .0025$ volts d-c to inputs.
17. Adjust gain resistor R-104 for exactly 50 divisions of left pen deflection.
18. Remove input signal and note that pen returns to right chart edge. If it does not, repeat steps 15, 16, 17 and 18.
19. Remove all test connections, unit is ready for use.

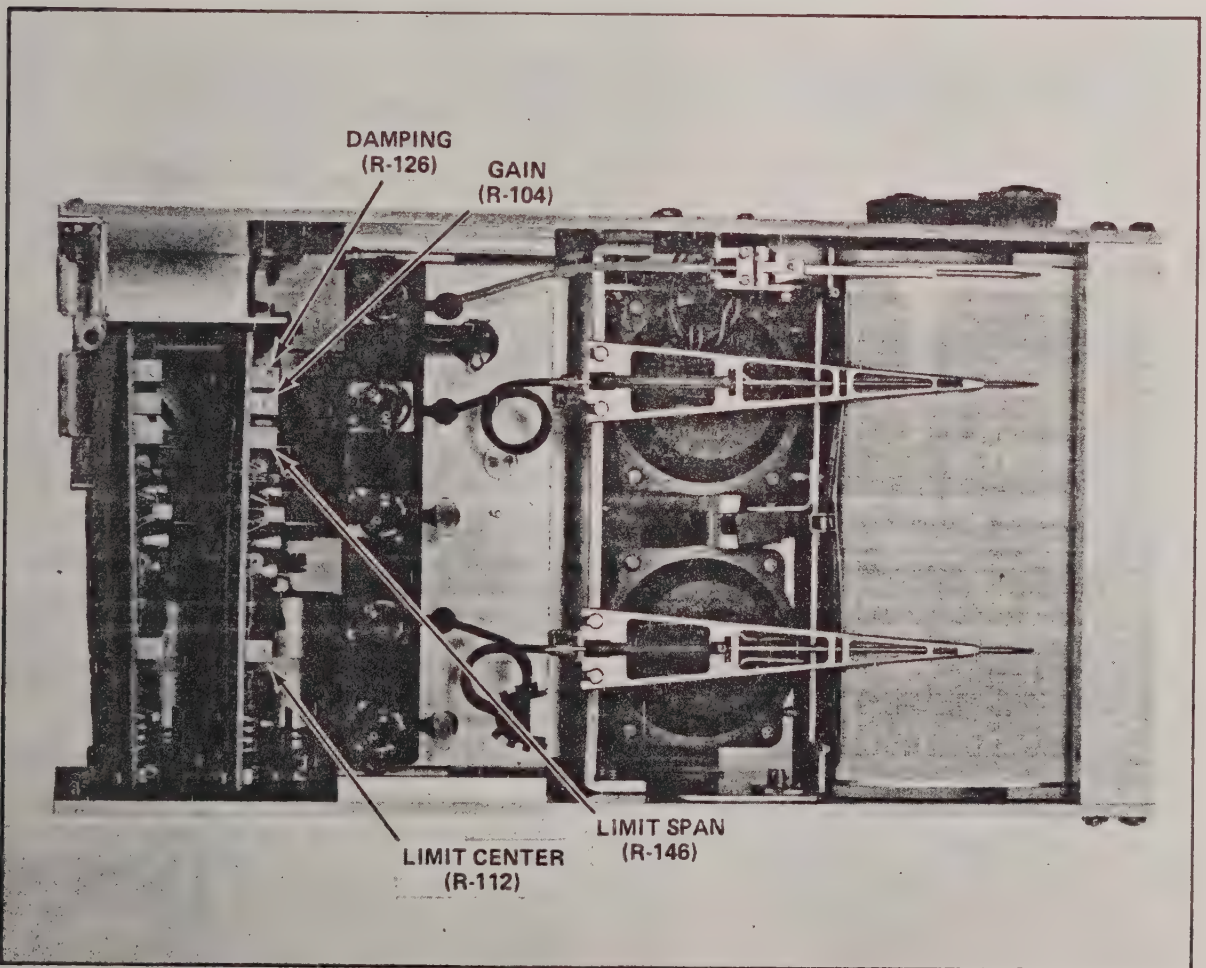


FIGURE 5-3 DRIVE AMPLIFIER ADJUSTMENT CONTROLS

SECTION VI

THEORY OF OPERATION

1 GENERAL

The Brush Single and Dual-Channel Recorders consist of analog channels, their associated penmotors, drive amplifiers and power supplies. The input to each channel is single-ended.

The penmotor drive amplifier is a complete servo-type system utilizing a Metrisite transducer in the penmotor to develop position and electronically derived velocity and acceleration signals. These signals are summed with an input signal in a d-c error amplifier that supplies power for driving the oscillographic penmotor.

The penmotors connect electrical signals to the mechanical pen which records thru a balanced hydrostatic ink system on chart paper which is driven past the pens by a motor.

2 DETAILED DESCRIPTION

General

The amplifier assembly (refer to schematic 282434) consists of four main sections: input preamplifier; limiter; error amplifier; and oscillator-demodulator.

Preamplifier

The preamplifier consists of integrated circuit U-101 and its associated components. The actual sensitivity is determined by resistors R-101 and R-102. Resistor R-102 sets the gain of the amplifier. Resistor R-101 is used to protect the input.

Limiter

Integrated circuit U-102 and its associated components form the limiter. In the linear operating range of the amplifier, the gain is set by resistors R-105 and R-106. The input signal comes directly through until the output voltage is great enough to trigger zener diode CR-103 or CR-106, and the output is kept from increasing further.

Error Amplifier

The error amplifier is composed of operational amplifier U-103, transistors Q-101, Q-102, Q-103, Q-104 and associated components. The input signal is applied to the amplifier through resistor R-109. A current

proportional to the actual pen position is applied through resistor R-123. If the two currents are equal but opposite in polarity, the pen is in the proper position, so there is no error. However, when the pen is not in the correct position the error amplifier senses the inequality and applies power to the penmotor drive coil to move the pen to correct the error.

e. Oscillator-Demodulator

The oscillator is an amplitude stabilized Wein-Bridge type. Capacitors C-102 and C-103 and resistors R-137 and R-138 form the actual Wein-bridge feedback network for the amplifier U-104. The bridge forces the amplifier to oscillate at the bridge's frequency which, in this case is 10K Hz. Amplitude control is achieved by applying negative feedback through resistors R-135 and R-136 and field effect transistor Q-109. In this circuit Q-109 acts as a variable resistor whose resistance is set by the voltage applied to the gate. Gate voltage is derived directly by rectifying the oscillator output with diode CR-116 and then filtering it. The voltage then sets the oscillator's operating point. Any change in the output voltage causes the bias to change which corrects and stabilizes the output.

Transistors Q-110 and Q-111 are used to obtain the necessary current to drive the primary of the Metrisite feedback element and demodulator transistor Q-107 and Q-108.

The output of the Metrisite is an amplitude-varying, 20K Hz signal. The signal is demodulated by the phase sensitive demodulator (Q-107 and Q-108) and filtered to be used as the position feedback voltage.

SECTION VII

TROUBLESHOOTING

7.1 GENERAL

This section contains a troubleshooting table to assist operating personnel in isolating malfunctions that may occur during normal operation of recorder.

CAUTION: ANY SERVICE THAT MAY BE REQUIRED IN THIS SECTION SHOULD BE PERFORMED ONLY BY QUALIFIED SERVICE PERSONNEL.

7.2 TROUBLESHOOTING TABLE

MALFUNCTION	CAUSE	REMEDY
1. Recorder inoperative	a. Main power not connected to source	a. Connect power to source
	b. Power on-off switch in off position	b. Switch to on position
	c. Blown fuse	c. Replace fuse (F-301 or F-302)
	d. Open interlock	
	1) Paper supply exhausted	1) Install new roll
	2) Writing table not engaged properly	2) Engage properly
	e. Defective interlock switch	e. Repair and/or replace
2. No power to pens (pens limp)	f. Defective on-off switch	f. Replace
	a. Power on-off switch in off position	a. Switch to on position
	b. Blown fuse	b. Replace fuse (F-301 or F-302)
	c. Main power not connected to source	c. Connect to correct power source
3. Chart paper drive does not operate	c. Main power not connected to source	c. Connect to correct power source
	a. Power switch in off position	a. Switch to on position
	b. Paper supply exhausted	b. Install new roll
	c. Writing table improperly engaged.	c. Engage properly
	d. Defective interlock switch	d. Repair and/or replace
	e. Defective motor	e. Replace

MALFUNCTION	CAUSE	REMEDY
4. Chart paper speed incorrect	a. Incorrect line voltage and/or frequency	a. Check for correct line voltage and frequency
	b. Defective motor	b. Replace
5. Pen writes intermittently or not at all	a. Insufficient writing fluid supply	a. Replace ink cartridge (Para. 4.7 or 4.8)
	b. Pen clogged	b. Clean pen (Para. 4.6, b.,6)
	c. Ink valve off	c. Turn ink valve to on position
6. Pen trace extremely heavy	a. Improper pen pressure	a. Adjust pen pressure (Para. 4.5)
	b. Pen not in full contact with paper	b. Lap pen (Para. 4.6)
	c. Pen not in contact with paper, due to wear on tip of pen	c. Replace pen (Para. 4.2 or 4.3)
	d. Noise coming thru drive amplifier, or signal source	d. Eliminate noise source
7. Pen gouges or tears paper	a. Improper pen pressure	a. Adjust pen pressure (Para. 4.5)
	b. Paper not centered	b. Center paper on writing table (Para. 3.2)
	c. Defective pen tip	c. Lap pen (Para. 4.6)
8. Pen will not travel on time	a. Improper pen alignment	a. Align pen (Para. 4.2)
	b. Loose pen	b. Align and tighten pen
9. Pen does not return to same spot	a. Loose pen	a. Align and tighten pen (Para. 4.2)
	b. Recorder out of calibration	b. Calibrate recorder (Section V)
10. Pen does not move with input signal applied	a. Blown fuse, F-301 or F-302	a. Replace fuse
	b. Improper input connections	b. Check input connections
	c. Defective preamplifier	c. Replace and/or repair
	d. Defective drive amplifier and/or power supply	d. Replace and/or repair
	e. Defective cabling, and/or connections	e. Replace and/or repair

SECTION VIII

PARTS IDENTIFICATION

8.1 GENERAL

This recorder has been accurately calibrated and adjusted before shipment from the factory and should give long, trouble-free service. For servicing beyond the scope of the instructions contained in this manual or the technical equipment available, contact your nearest Brush Service Engineer listed on the warranty card shipped with the recorder.

The following parts lists and schematic diagrams are designed to assist in servicing and repairing the recorder.

NOTE: Check to be sure the schematic number and revision letter stamped on the rear of the recorder agree with the number and revision letter on the schematic contained in this section.

To assure prompt and satisfactory delivery of replacement parts, include the following with the purchase order:

1. Name, model number, and serial number of the instrument.

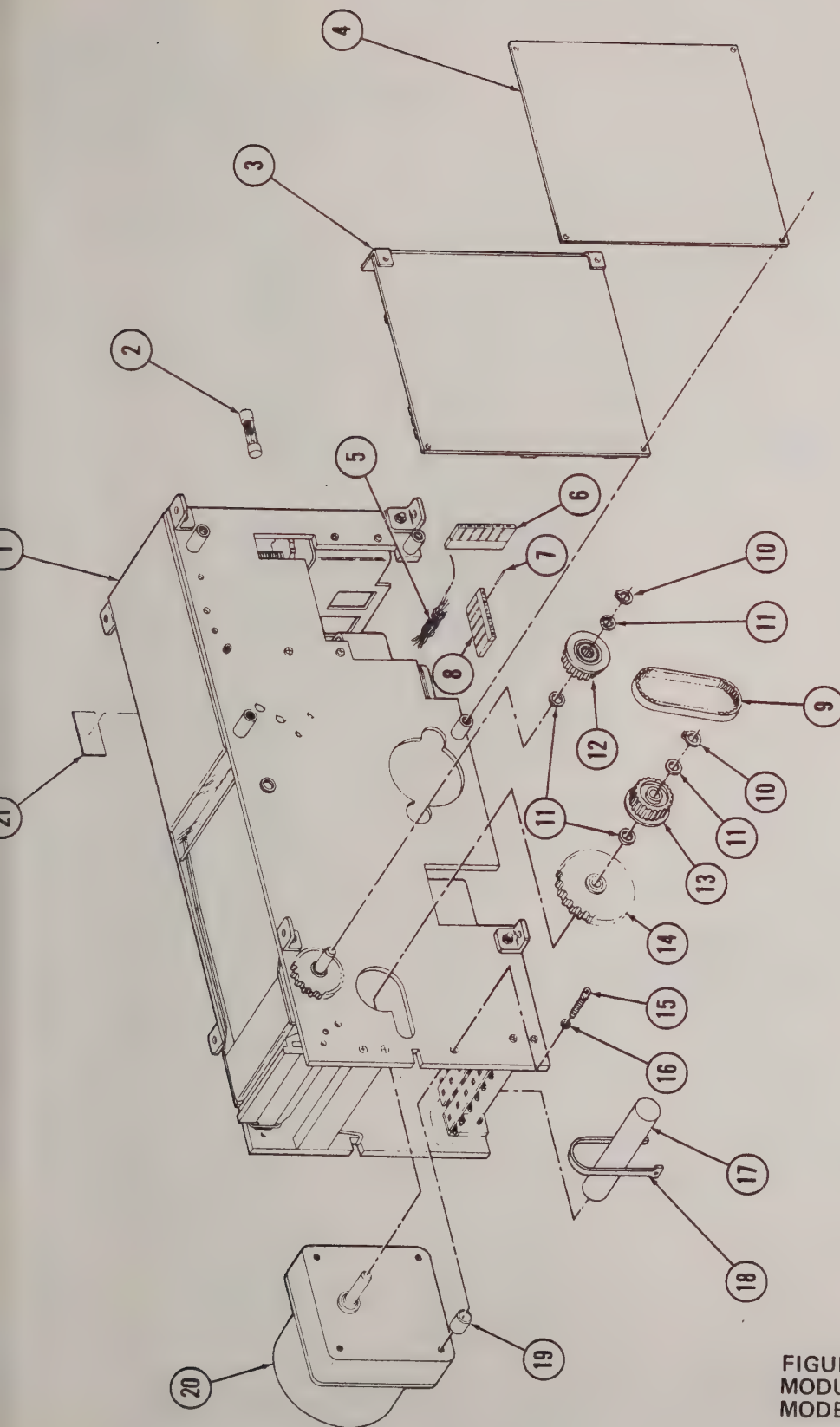
For Example: Brush Modular Recorder, Model 1201-6817-00, Serial Number _____.

2. Description of the part as listed in the manual.
3. Brush part number.

NOTE: Do not use the SYMBOL NUMBER from the parts list for identifying desired parts on the order.

FIGURE 8-1
EXPLODED VIEW PARTS LIST
MODULAR RECORDER MODEL X20X-6817-0X

Item No.	Part Number	Description
1	882354	Recorder Subasm. Low Profile (See Fig.8-2)
2	266924-7	Fuse (115V, 60Hz units)
2	266924-2	Fuse (230V, 50Hz units)
3	882358	Board Asm.
4	382328	Cover
5	882559	Harness Asm.
6	9-281501-8	Connector
7	281502-1	Contact
8	0-281501-8	Connector
9	269945-10	Belt, Timing
10	1-227070-9	Ring, Retaining
11	127271	Washer
12	682344	Pulley and Clutch Asm.
13	782436-2	Pulley, Timing belt
14	682342	Gear, Clutch Asm.
15	31-119922-8212	Screw, Mach., Socket Hd.
16	1-118195-307	Washer
17	281852-334	Capacitor (115V, 60Hz) Inc. w/item 20
17	281852-224	Capacitor (230V, 50Hz) Inc. w/item 20
18	232997-23	Strap, Retaining
19	263828-3	Spacer
20	283557-1	Motor (25+50mm/sec., 115V, 60Hz)
20	283557-2	Motor (25+50mm/sec., 230V, 50Hz)
21	465913-XXX	Plate, Ident.



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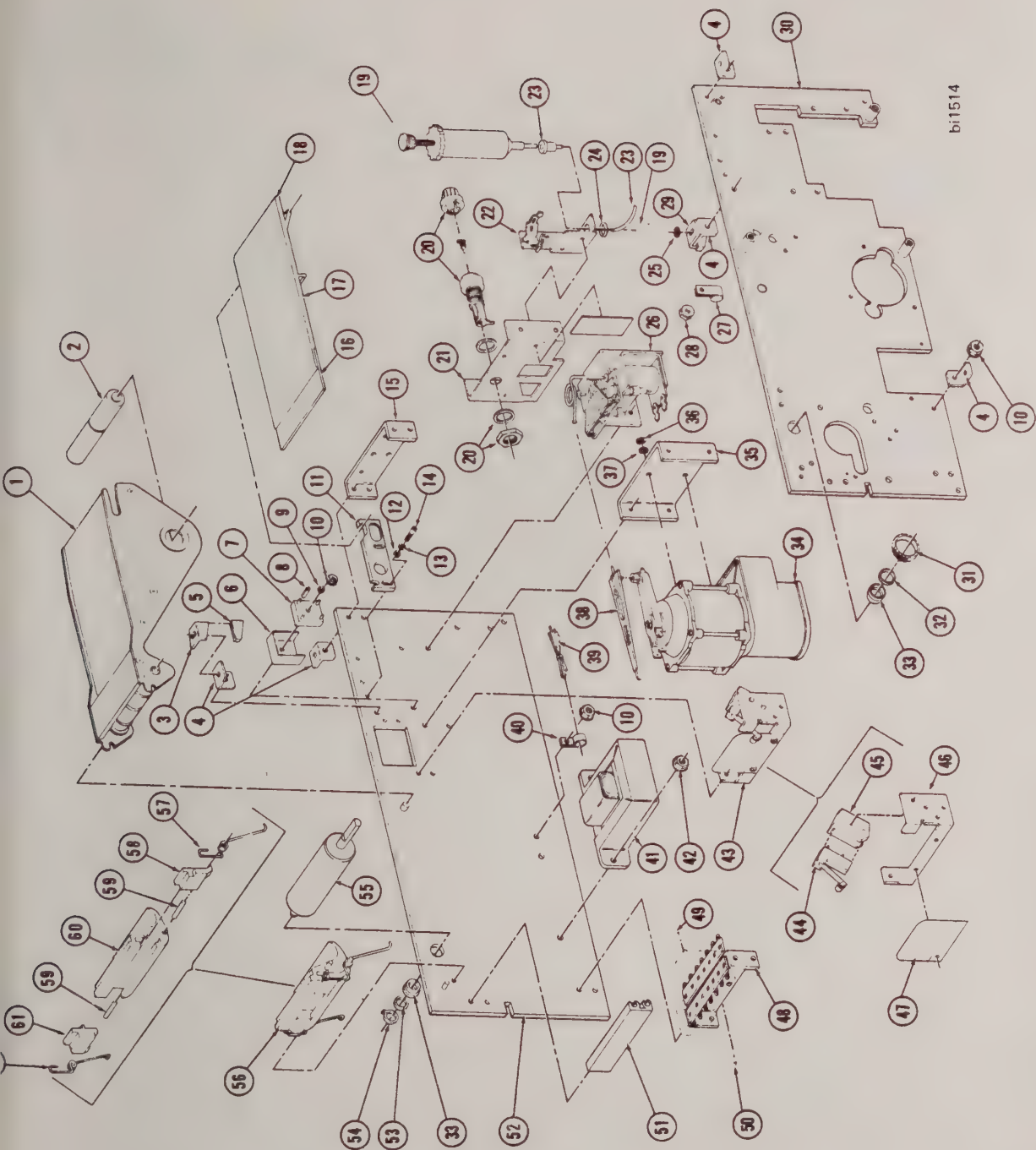
FIGURE 8-1
MODULAR RECORDER
MODEL X20X-6817-0X

FIGURE 8-2
EXPLODED VIEW PARTS LIST
MODULAR RECORDER SUBASSEMBLY
882354(115V, 60Hz units)
883382(230V, 50Hz units)

Item No.	Part Number	Description	Symbol
1	782550	Table Asm., Writing (See Fig. 8-3)	CR-302
2	782325	Roll Asm., Paper Supply	
3	283976	Bracket, L.H.	
4	1-265849-4	Bracket	
5	130327-6	Insulation, Shrink-on	
6	282653	Insulator	
7	265420-1	Diode	
8	0-108400-11	Insulation, Flex Sleeve-Part of Item 39	
9	1-118195-305	Washer, Plain	
10	243898-62	Nut, Asm.	
11	282322	Latch, Panel	
12	1-216741-403	Lockwasher	
13	11305-37	Washer, Plain	
14	31-119922-2606	Screw, Mach.-So.Hd.	
15	282181	Bracket, Support	
16		Not Used	
17		Not Used	
18	684404	Cover Asm.	
19	11-2735-04	Ink Cartridge Asm.	
20	129758	Fuse Holder	
21	382326	Bracket, Connectors, Fuse & Ink Cart.	
22	683782	Bracket Asm.	
23	682511	Tube Asm.	
24	1-127657-6	Ring, Retaining	
25	1-216741-420	Lockwasher	
26	783340	Manifold Asm. For No. 883382 (See Fig. 8-4)	
26	781394	Manifold Asm. For No. 882354 (See Fig. 8-4)	
27	243225-3	Clamp, Loop	
28	243898-40	Nut Asm.	
29	283974	Bracket, R.H.	
30	782455	Plate Asm., Right Side	
31	282150	Gear, Spur	
32	128967-4	Washer, Nylon	
33	262379-1	Bearing, Ball	
34	882160	Penmotor Asm.(See Fig. No. 8-5)	
35	282183	Bracket, Penmotor Mtg.	
36	1-216741-425	Lockwasher	
37	1-118195-307	Washer, Plain-Flat	
38	11-2823-33	Pen & Hub. Asm., Ink	
39	882559	Harness Asm.	
40	232660-4	Clamp, Loop	

FIGURE 8-2
EXPLODED VIEW PARTS LIST
MODULAR RECORDER SUBASSEMBLY
882354(115V, 60Hz units)
883382(230V, 50Hz units) (continued)

Item No.	Part Number	Description	Symbol
41	281849	Transformer	T-301
42	243898-82	Nut Asm.	
43	682348	Bracket Asm., Sw. Mtg.	
44	268937	Switch	
45	282441	Spacer	
46	282190	Bracket, Switch Mfg.	CR-301
47	282191	Spring	
48	681392	Bracket Asm. , MTG. Capacitor	
49	282240	Insulator	
50	130198-3	Diode	
51	682775-2	Support	
52	782457	Plate Asm. Left Side	
53	127271	Washer	
54	1-227070-9	Ring, Retainer	
55	682149	Roll, Drive	
56	782338	Lifter Asm., Writing Table	
57	282789	Spring	
58	282990-2	Support-R.H.	
59	240161-420	Pin., Straight	
60	682979-3	Lifter, Writing Table	
61	282990-1	Support-L.H.	
62	282791	Spring	



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FIGURE 8-2
RECORDER SUBASSEMBLY
882354 (115V, 60Hz)
883382 (230V, 50Hz)

FIGURE 8-3
EXPLODED VIEW PARTS LIST
TABLE ASSEMBLY 782550
(FOR MODEL XXXX-6817-0X)

ITEM NO.	PART NUMBER	DESCRIPTION
1	682773-2	Support
2	682994	Table, Writing
3	382834-2	Plate, Side-R.H.
4	13-262715-4006	Screw
5	282918	Spring
6	282336-1	Bearing, Sleeve
7	682138	Roll, Pinch
8	243867-11	O Ring
9	382834-1	Plate, Side - L.H.

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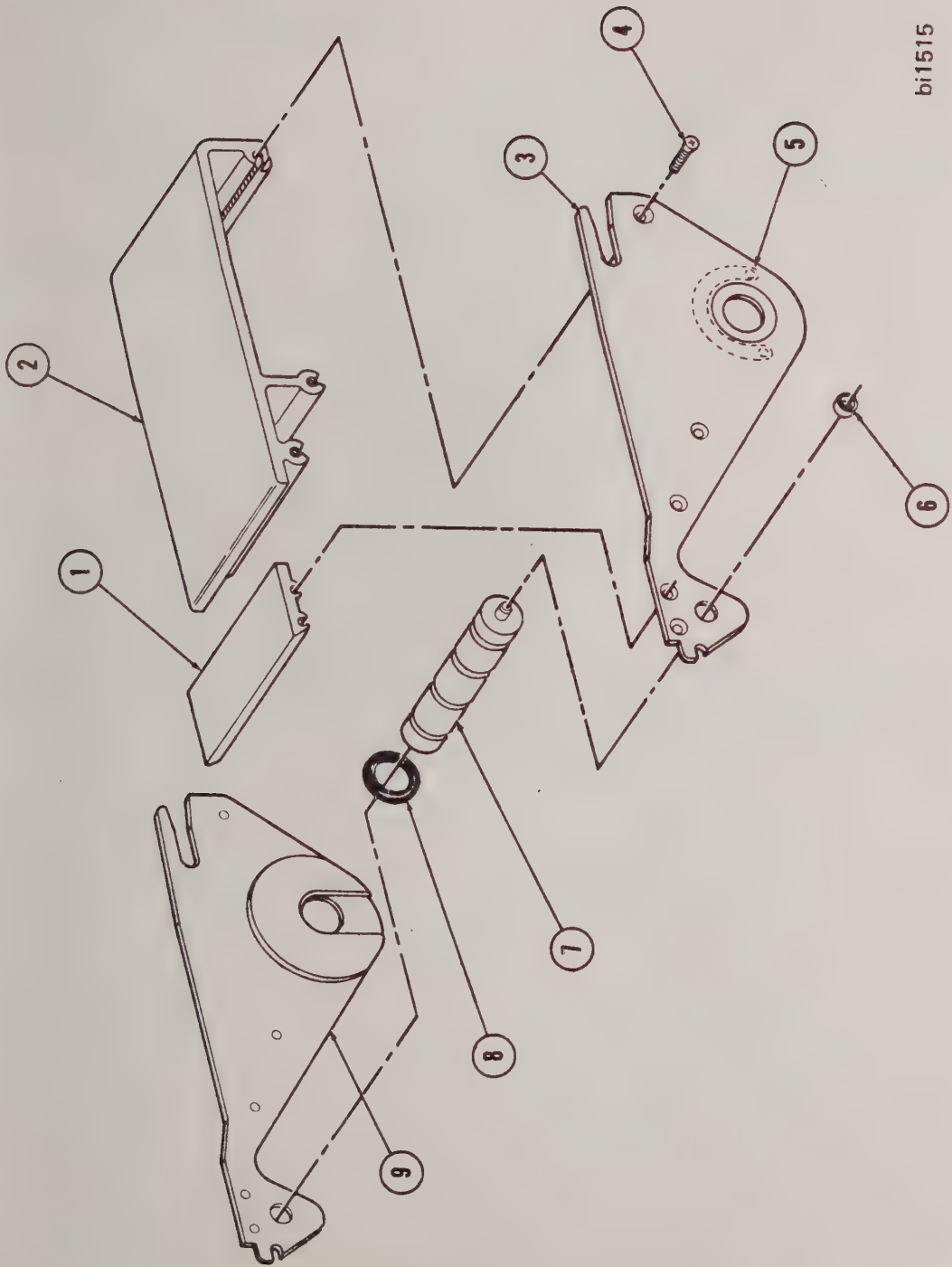
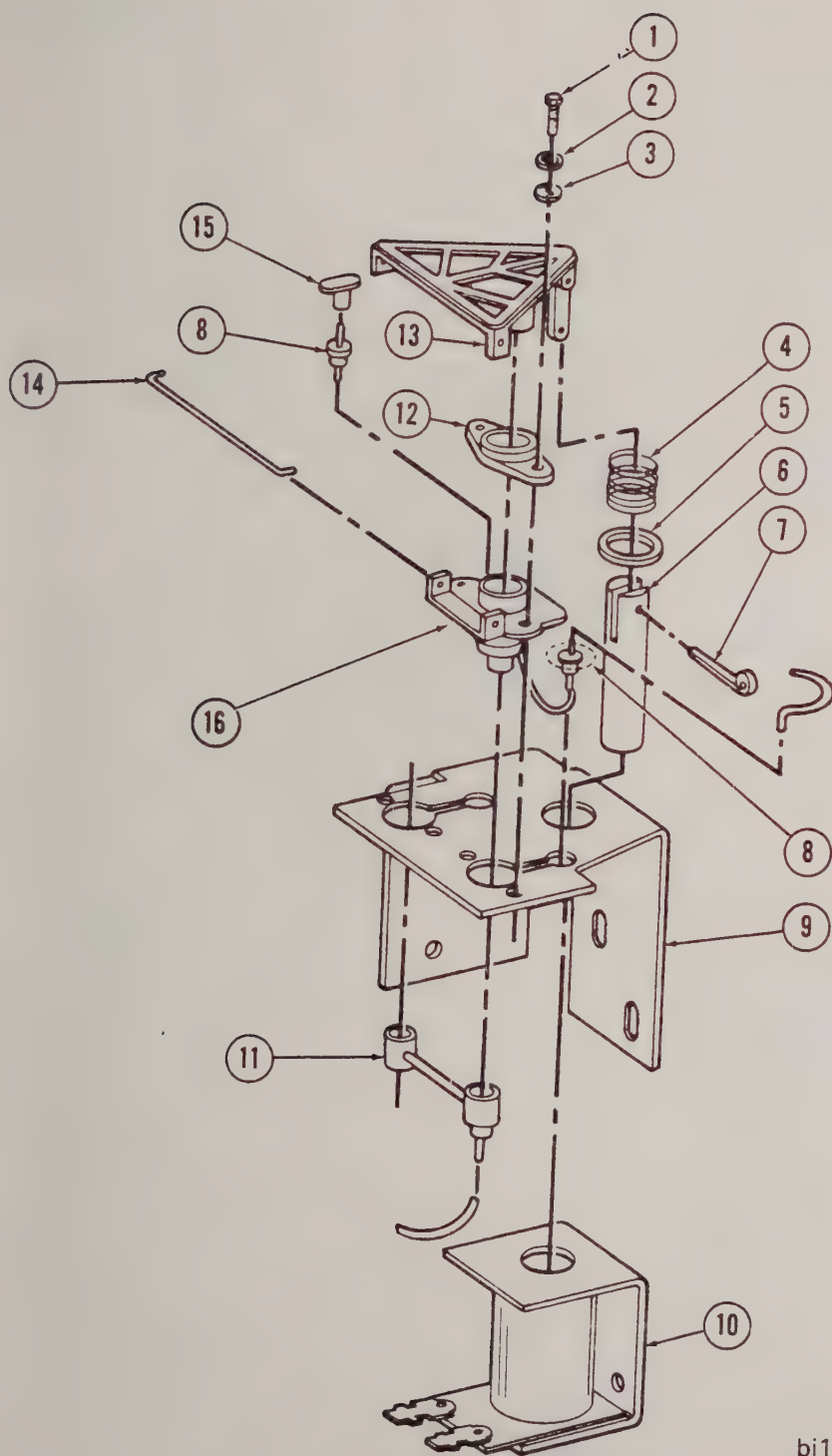


FIGURE 8-3
TABLE ASSEMBLY
782550

FIGURE 8-4
EXPLODED VIEW PARTS LIST
MANIFOLD ASSEMBLY 781394(115V, 60Hz)
783340(230V, 50Hz)
(FOR MODEL XXXX-6X17-0X)

ITEM No.	Part Number	Description	Symbol
1	31-119918-4005	Screw, Mach. Pan Hd.	
2	1-216741-411	Lockwasher, Spring	
3	1-118195-304	Washer, Plain	
4	282196	Spring, Compression	
5	382340-4	Washer	
6	382340-1	Link, Manifold Actuating	
7	236865-3	Cotter Pin	
8	667885	Tube Asm.	
9	282157	Bracket, Mtg.	
10	1-282285-1	Solenoid-For Dwg. No. 781394	L-301
10	1-282285-2	Solenoid-For Dwg. No. 783340	L-301
11	686078	Supply Manifold Asm.	
12	467355-3	Retainer, Diaphragm	
13	382340-2	Bracket, Manifold Actuating	
14	265989-1	Shaft	
15	249360	Cap, Ink Outlet	
16	*684169	Valve Asm.	

*Because of problems in replacement, Gould I.S.D. does not recommend replacing this item. Gould cannot guarantee leak-proof operation and recommends replacement of entire Manifold Assembly.

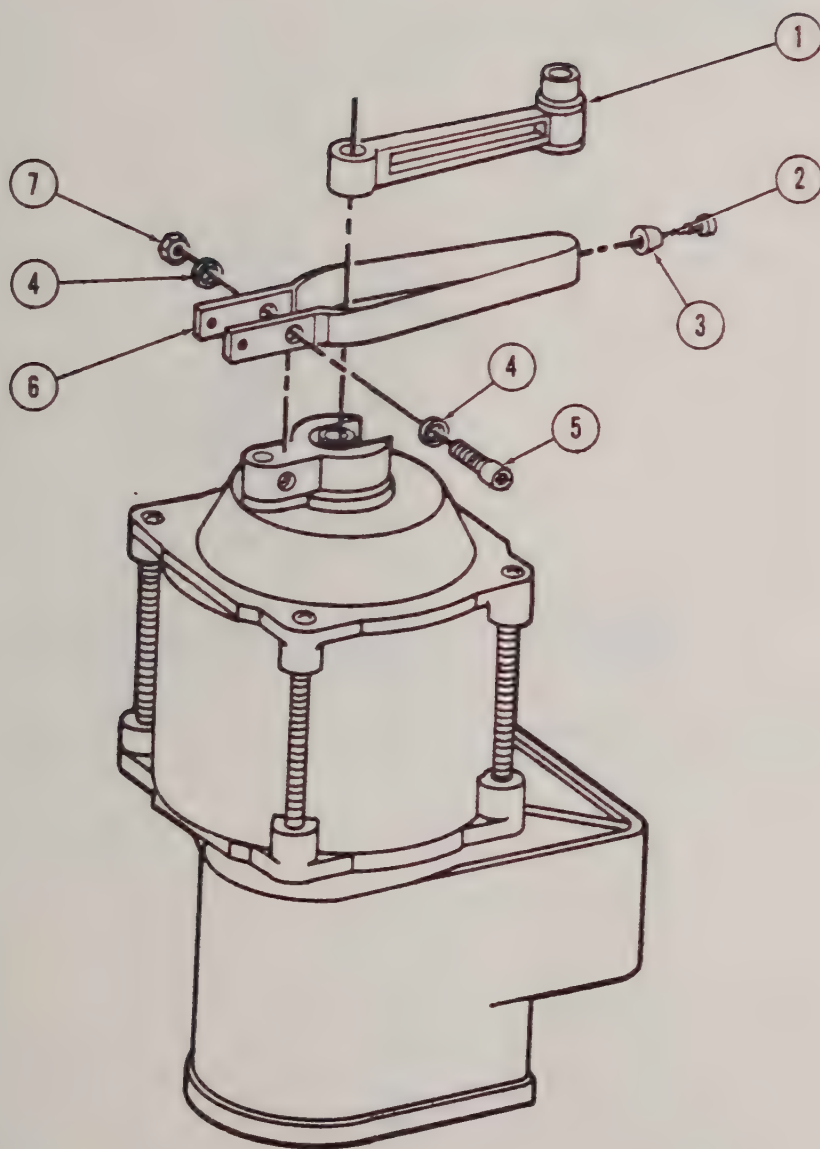


bi1516

FIGURE 8-4
MANIFOLD ASSEMBLY
 781394(115V, 60Hz)
 783340(230V, 50Hz)

FIGURE 8-5
PENMOTOR ASSEMBLY 882160
(FOR MODEL XXXX-68XX-0X)

ITEM NO.	PART NUMBER	DESCRIPTION
1	782189	Arm Asm., Drive
2	31-241908-0002	Screw, Cap, So.Hd.
3	241227	Washer, Band Clamping
4	11305-37	Washer
5	31-119922-2606	Screw
6	682143	Drive Band Asm.
7	31-129647-26	Nut, Hex



bi1517

FIGURE 8-5
PENMOTOR ASSEMBLY
882160

PARTS IDENTIFICATION

FIGURE 8-6
EXPLODED VIEW PARTS LIST
MANIFOLD ASSEMBLY 869022
(FOR MODEL XXXX-6X27-0X)

ITEM NO	PART NUMBER	DESCRIPTION	SYMBOL NO
1	467355-6	Knob, Ink Control	L-301
2	467355-5	Screw, Operator	
3	236865-2	Cotter Pin	
4	365991	Lever, Operator	
5	265990	Link, Connecting	
6	249360	Cap, Ink Outlet	
7	236865-3	Cotter Pin	
8	266888	Solenoid	
9	2-128693-3	Grommet	
10	666582	Tube, Cartridge-to-Manifold	
11	241843	Nipple	
12	367081	Manifold	
13	265989	Shaft	
14	269683	Spring	
15	267858	Diaphragm	
16	467355-2	Retainer, Diaphragm	
17	684169*	Valve Assembly	

Because of problems in replacement, I.S.D. does not recommend replacing this item.
I.S.D. cannot guarantee leak-proof operation and recommends replacement of entire
Manifold Assembly, Part No. 869022.

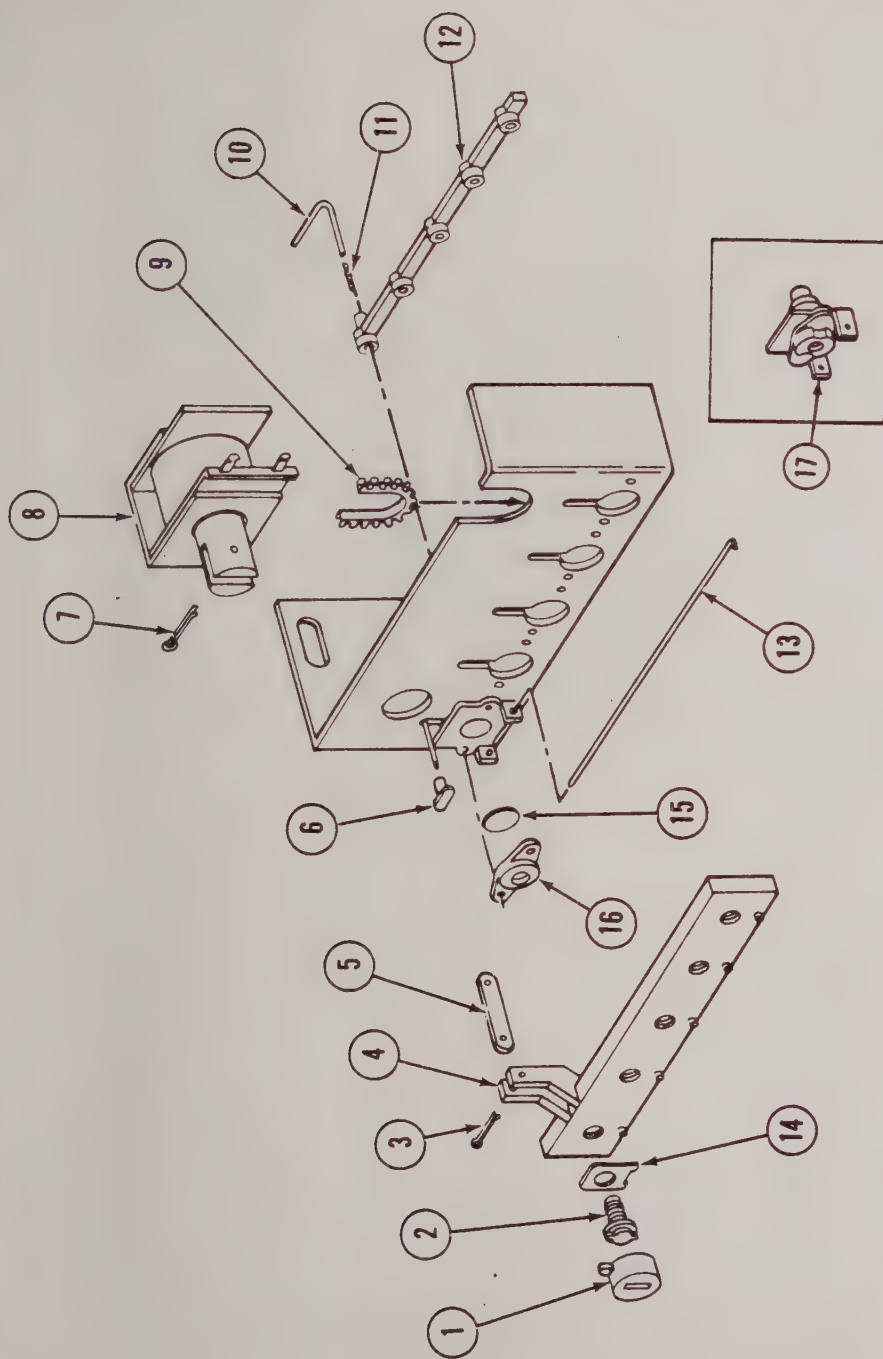
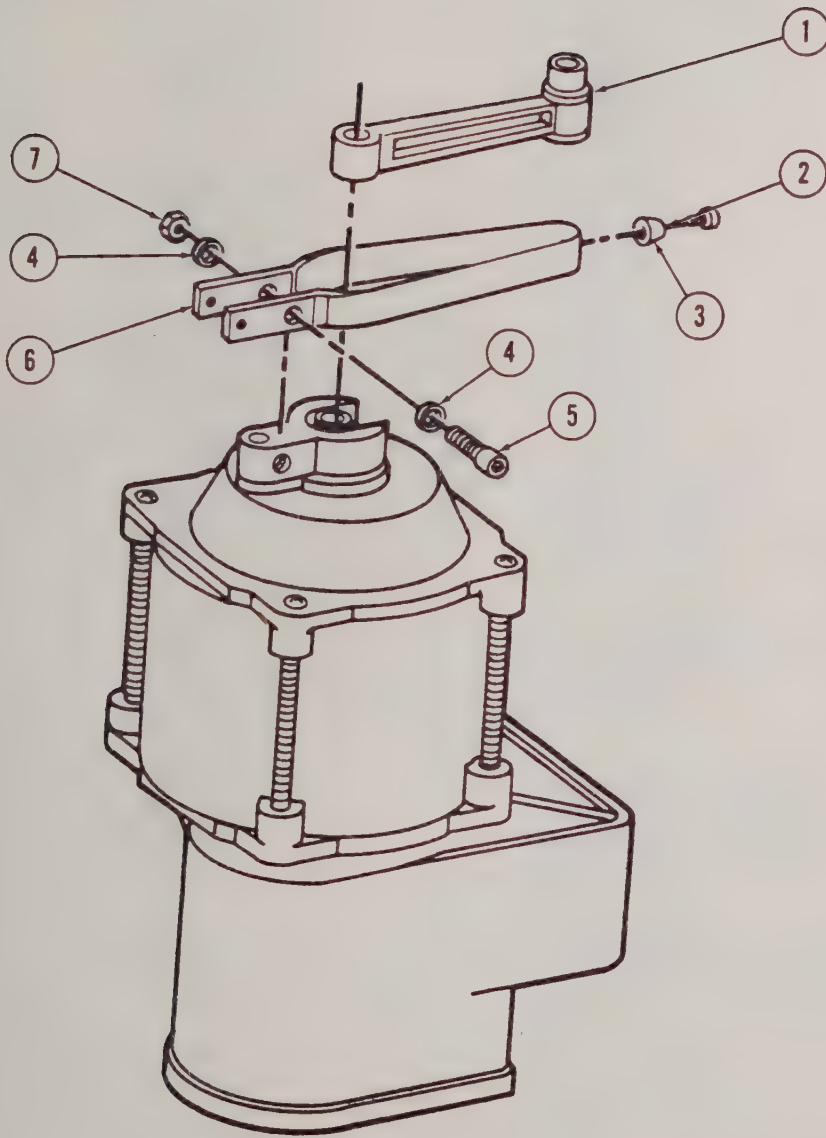


FIGURE 8-6
MANIFOLD ASSEMBLY
869022

FIGURE 8-7
EXPLODED VIEW PARTS LIST
PENMOTOR ASSEMBLY 882158
(FOR MODEL XXXX-69XX-0X)

ITEM NO.	PART NUMBER	DESCRIPTION
1	782336	Arm Asm., Drive
2	31-241908-2602	Screw, Cap
3	281396	Washer, Band Clamping
4	11305-37	Washer
5	31-119922-2605	Screw
6	682145	Drive Band Assembly
7	31-129647-26	Nut. Hex



bi1517

FIGURE 8-7
PENMOTOR ASSEMBLY
882158

ELECTRICAL PARTS LIST
DRIVE AMPLIFIER BOARD ASM 783790
FIGURE 8-8

SYMBOL NO	PART NUMBER	DESCRIPTION
C-101	20-247195-203	
C-102	10-247116-102	Capacitor
C-103	10-247116-102	Capacitor
C-104	230098-104	Capacitor
C-106	262585-475	Capacitor
C-107	262585-475	
C-108	10-125904-223	Capacitor
C-109	20-247195-203	Capacitor
C-110	20-247195-203	Capacitor
C-111	20-247195-203	Capacitor
C-112	20-247195-203	
C-113	50-281295-108	Capacitor
C-114	50-281295-108	Capacitor
C-115	See NOTE	Capacitor
CR-101	244896	
CR-102	244896	Diode, 1N458A
CR-103	249747	Diode, 1N458A
CR-104	244896	Diode, Zener, 1N752A
CR-105	244311	Diode, 1N458A
		Diode, 1N277
CR-106	249747	
CR-107	244896	Diode, Zener, 1N752A
CR-108	244311	Diode, 1N458A
CR-109	231887	Diode, 1N277
CR-110	231887	Diode, S1-1
		Diode, S1-1
CR-111	280870-1	
CR-112	280870-1	Diode, Zener, 1N5245B
CR-113	282295-5	Diode, Zener, 1N5245B
CR-114	244311	Diode, Rectifier, VE-28
CR-115	244311	Diode, 1N277
		Diode, 1N277
CR-116	244896	
CR-117	249747	Diode, 1N458A
CR-118	231887	Diode, Zener, 1N752A
CR-119	231887	Diode, S1-1
		Diode, S1-1
J-101	281711	
J-102	281711	Connector
		Connector
L-101	263453-1	Reactor
Q-101	242323	
Q-102	247149	Transistor
Q-103	284421	Transistor
Q-104	284423	Transistor
Q-105	242323	Transistor
		Transistor

ELECTRICAL PARTS LIST (Continued)
 DRIVE AMPLIFIER BOARD ASM 783790
 FIGURE 8-8

SYMBOL NO	PART NUMBER	DESCRIPTION
Q-106	247149	Transistor
Q-107	240236	Transistor, 2N1303
Q-108	240237	Transistor, 2N1302
Q-109	281857-2	Transistor, 2N5033
Q-110	242323	Transistor
Q-111	247149	Transistor
R-101	See NOTE	Resistor
R-102	See NOTE	Resistor
R-103	1-281851-30001	Resistor
R-104	268940-202	Resistor, Variable
R-105	1-281851-50000	Resistor
R-106	1-281851-16001	Resistor
R-107	5-241111-392	Resistor
R-108	5-241111-101	Resistor
R-109	1-281851-15002	Resistor
R-110	1-281851-10003	Resistor
R-111	5-241111-103	Resistor
R-112	268940-503	Resistor, Variable
R-113	5-241111-183	Resistor
R-114	5-241111-183	Resistor
R-115	5-241111-471	Resistor
R-116	5-241111-471	Resistor
R-117	5-241111-471	Resistor
R-118	5-241111-471	Resistor
R-119	5-241111-332	Resistor
R-120	5-241111-332	Resistor
R-121	5-241111-474	Resistor
R-122	5-241111-273	Resistor
R-123	1-281851-27001	Resistor
R-124	5-241111-103	Resistor
R-125	5-241111-122	Resistor
R-126	268940-103	Resistor, Variable
R-127	5-241111-472	Resistor
R-128	5-241111-472	Resistor
R-129	5-241111-103	Resistor
R-130	5-241111-103	Resistor
R-131	1-281851-15001	Resistor
R-132	1-281851-15001	Resistor
R-133	1-281851-50000	Resistor
R-134	1-281851-20000	Resistor
R-135	5-241111-103	Resistor

ELECTRICAL PARTS LIST (Continued)
DRIVE AMPLIFIER BOARD ASM 783790
FIGURE 8-8

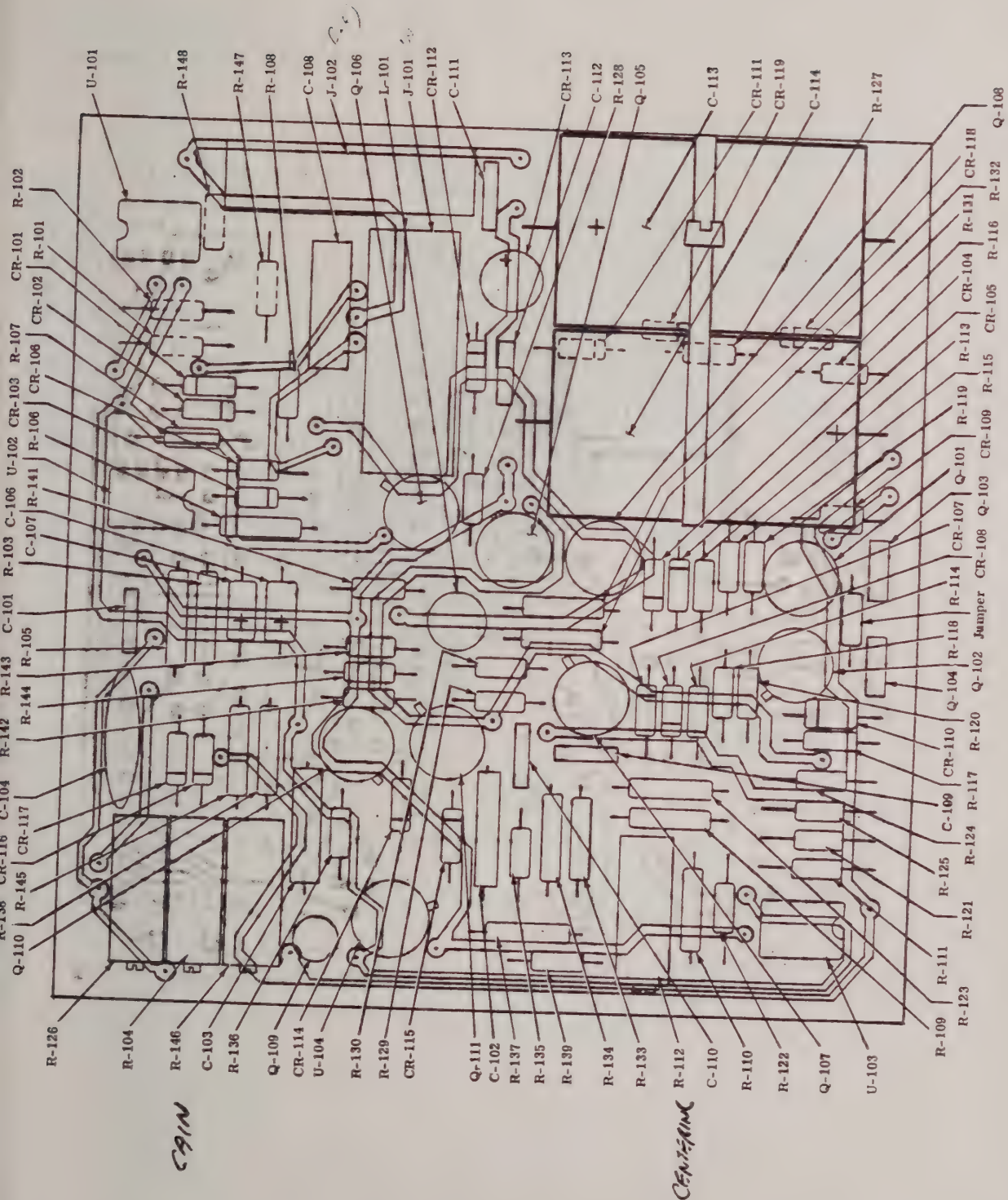
SYMBOL NO	PART NUMBER	DESCRIPTION
R-136	5-241111-332	Resistor
R-137	1-281851-80000	Resistor
R-138	1-281851-80000	Resistor
R-139	5-241111-274	Resistor
R-141	5-241111-333	Resistor
R-142	5-241111-333	Resistor
R-143	5-241111-680	Resistor
R-144	5-241111-680	Resistor
R-145	1-281851-50000	Resistor
R-146	268940-503	Resistor
R-147	See NOTE	Resistor
R-148	See NOTE	Resistor
U-101	280863-3	Semiconductor, 741
U-102	280863-3	Semiconductor, 741
U-103	280863-3	Semiconductor, 741
U-104	269941-1	Semiconductor, MC1439

NOTE: Refer to Table 8-1 for part number of variable components.

TABLE 8-1
VARIABLE COMPONENT PART NUMBERS

DRIVE AMPLIFIER BOARD SUFFIX							
P.	-1	-2	-3	-4	-5	-6	-7
	1-281851-50001	1-281851-20001	1-281851-50001	1-281851-50001	1-281851-50001	1-281851-10003	1-281851-25001
2	1-281851-50001	1-265969-20003	1-281851-49502	1-281851-24002	1-281851-10002	1-281851-49501	1-281851-25001
7	*	*	*	*	*	1-281851-50001	1-281851-25001
8	*	1-281851-20001	1-281851-55001	1-281851-60001	1-281851-10002	1-281851-50001	1-281851-25001
	*	10247116-102	*	*	*	*	*

icates part not used in this configuration.



DRIVE AMPLIFIER
BOARD ASM 783790
FIGURE 8-8

**ELECTRICAL PARTS LIST
BRUSH MODULAR RECORDERS**

PART NO.	DESCRIPTION	SYMBOL NO.
882158	Penmotor (Vertical units only)	
882160	Penmotor (Low-Profile units only)	
130198-3	Diode	CR-301
130198-3	Diode (Dual Channel units only)	CR-302
281849	Transformer	T-301
281849	Transformer (Dual Channel units only)	T-302
266924-2	Fuse Single Channel 230V 50Hz Units	F-301
266924-7	Fuse Single Channel 115V 60Hz Units	F-301
116198-10	Fuse Dual Channel 115V 60Hz Units	F-301
116198-8	Fuse Dual Channel 115V 60Hz Units	F-302
116198-8	Fuse Dual Channel 230V 50Hz Units	F-301
116198-6	Fuse Dual Channel 230V 50Hz Units	F-302

NOTE: Refer to the applicable schematic for the part no. of the motor/starter capacitor for your unit.

FIGURE 8-9
EXPLODED VIEW PARTS LIST
ACCESSORY CHART TAPE-UP
MODEL 11-6402-08
FOR USE ON XXXX-6X1X-0X

ITEM NO	PART NUMBER	DESCRIPTION
1	782980	Reel Assy, Take-Up
2	282907	Shaft
3	247523-84	Plate, Identification
4	782876	Arm, Take-Up Assy
5	282907	Shaft
6	282150	Gear, Spur
7	382974-1	Pulley
8	782901	Cover, Arm Assy
9	127271	Washer, Flat
10	243867-5	"O" Ring
11	240731-10	Ring, Retaining External
12	382974-2	Pulley
13	243844	Packing, Preformed
14	2-217274-307	Pin, Spring

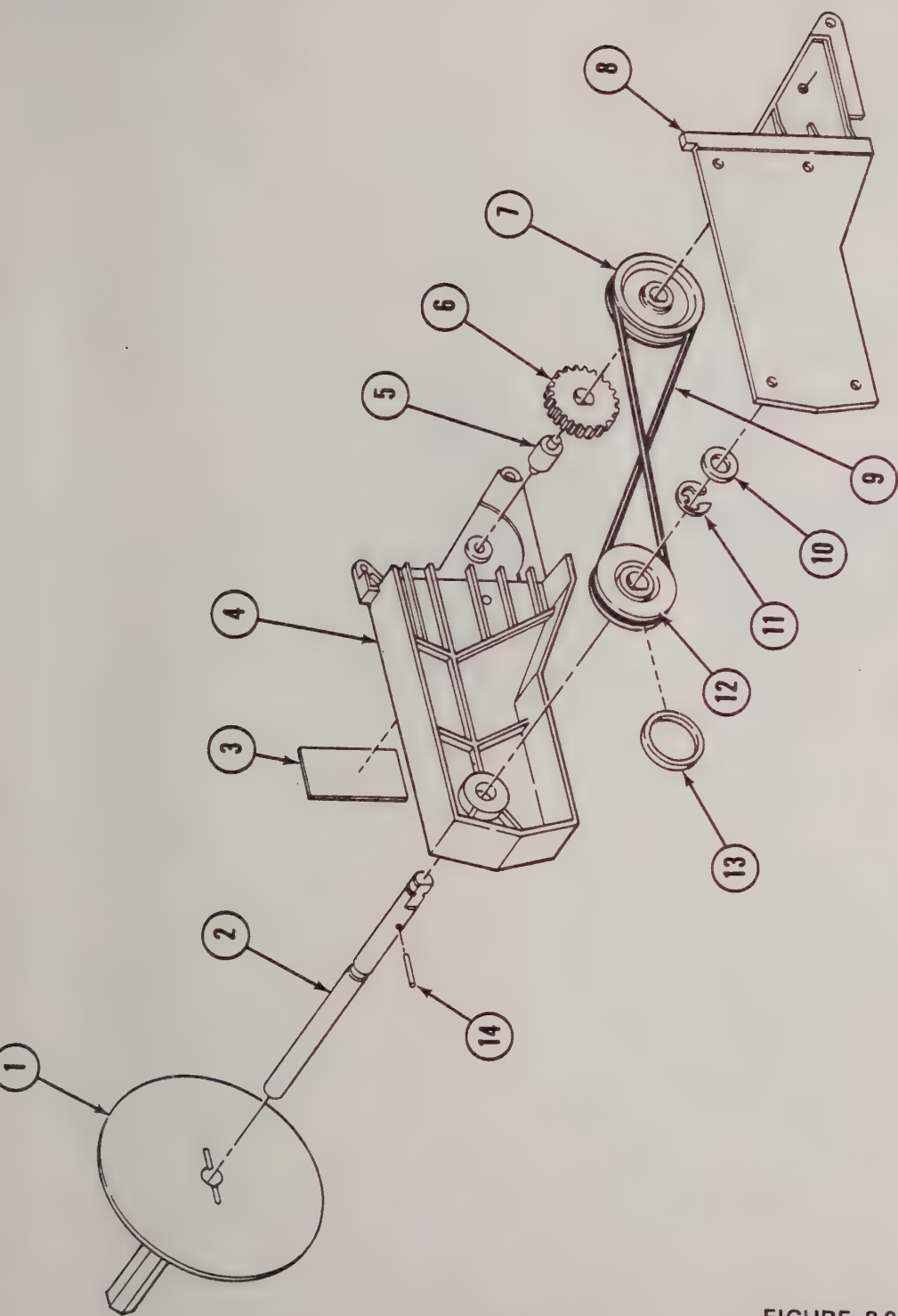


FIGURE 8-9
ACCESSORY CHART TAKE-UP
MODEL 11-6402-08

FIGURE 8-10
EXPLODED VIEW PARTS LIST
ACCESSORY CHART TAKE-UP
MODEL 11-6402-09
FOR USE ON XXXX-6X2X-0X

ITEM NO	PART NUMBER	DESCRIPTION
1	283118	Arm
2	283141	Core
3	382910-1	Flange
4	2-217274-307	Pin, Spring
5	247523-86	Plate, Identification
6	782876	Arm, Take-Up Assy
7	282909	Shaft
8	282150	Gear, Spur
9	243867-5	"O" Ring
10	382974-1	Pulley
11	782901	Cover, Arm Assembly
12	127271	Washer, Flat
13	240731-10	Ring, Retaining, External
14	382974-2	Pulley
15	243844	Packing, Preformed
16	283120	Shaft

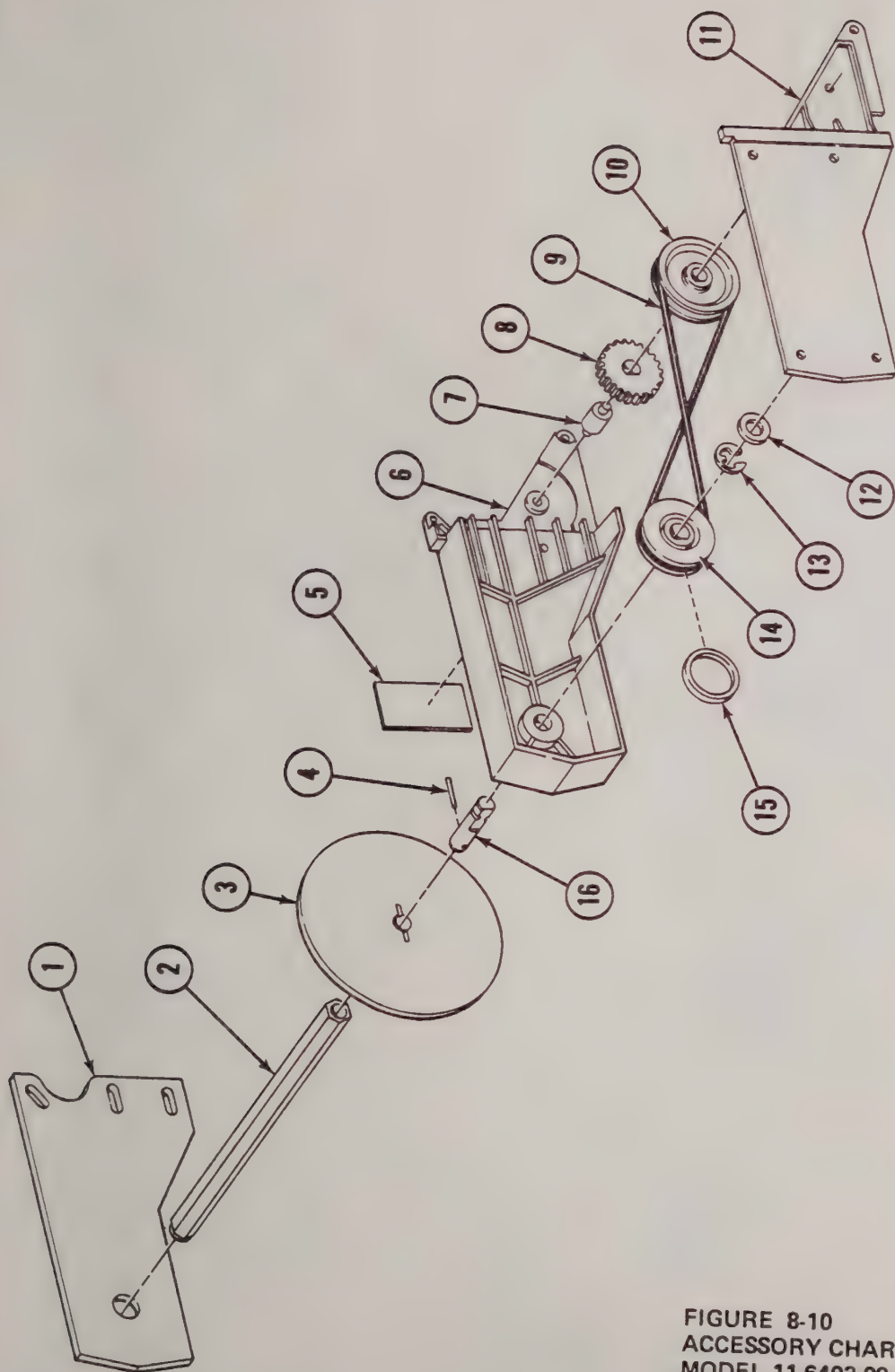
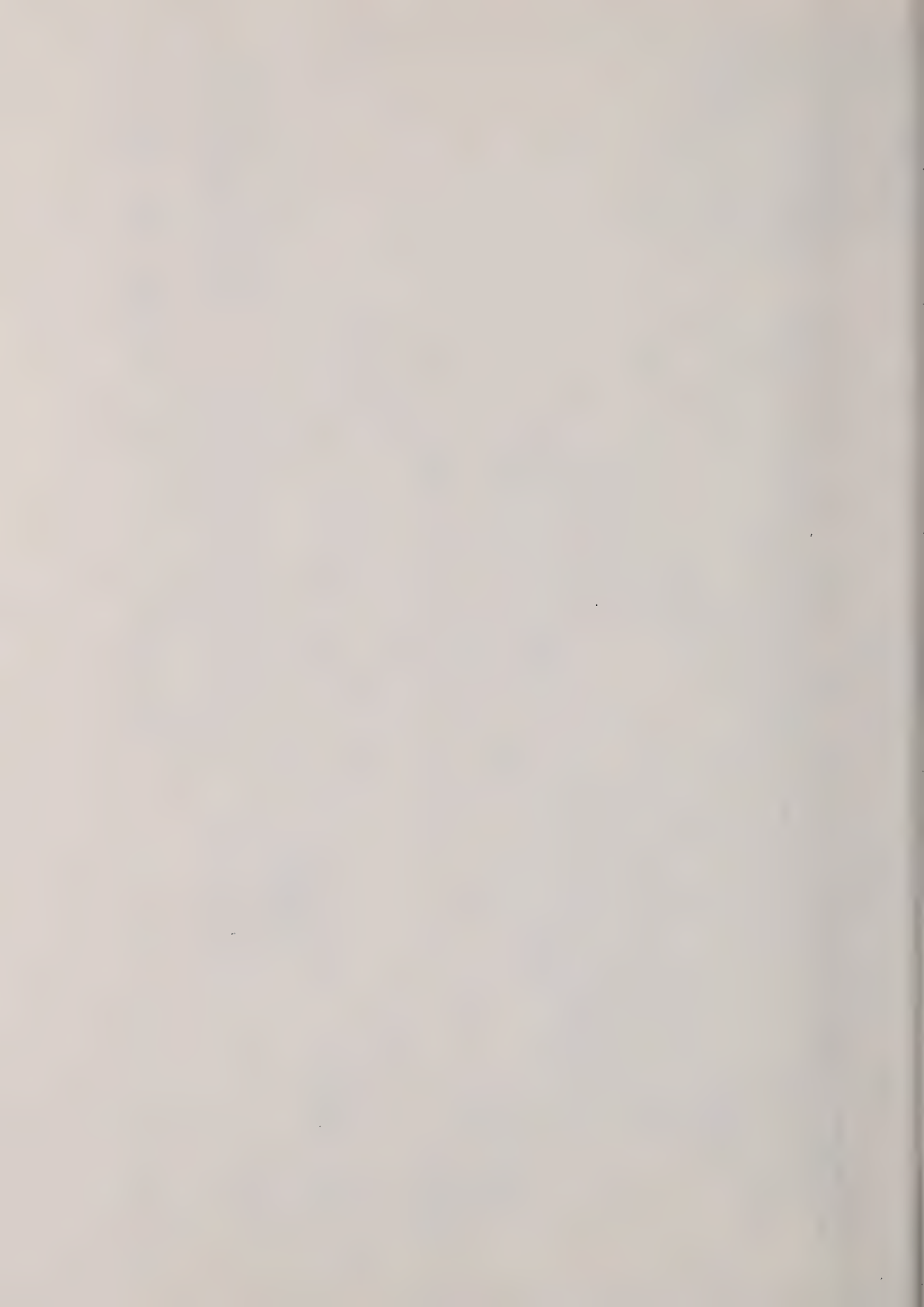
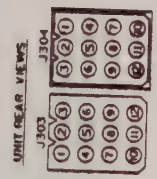
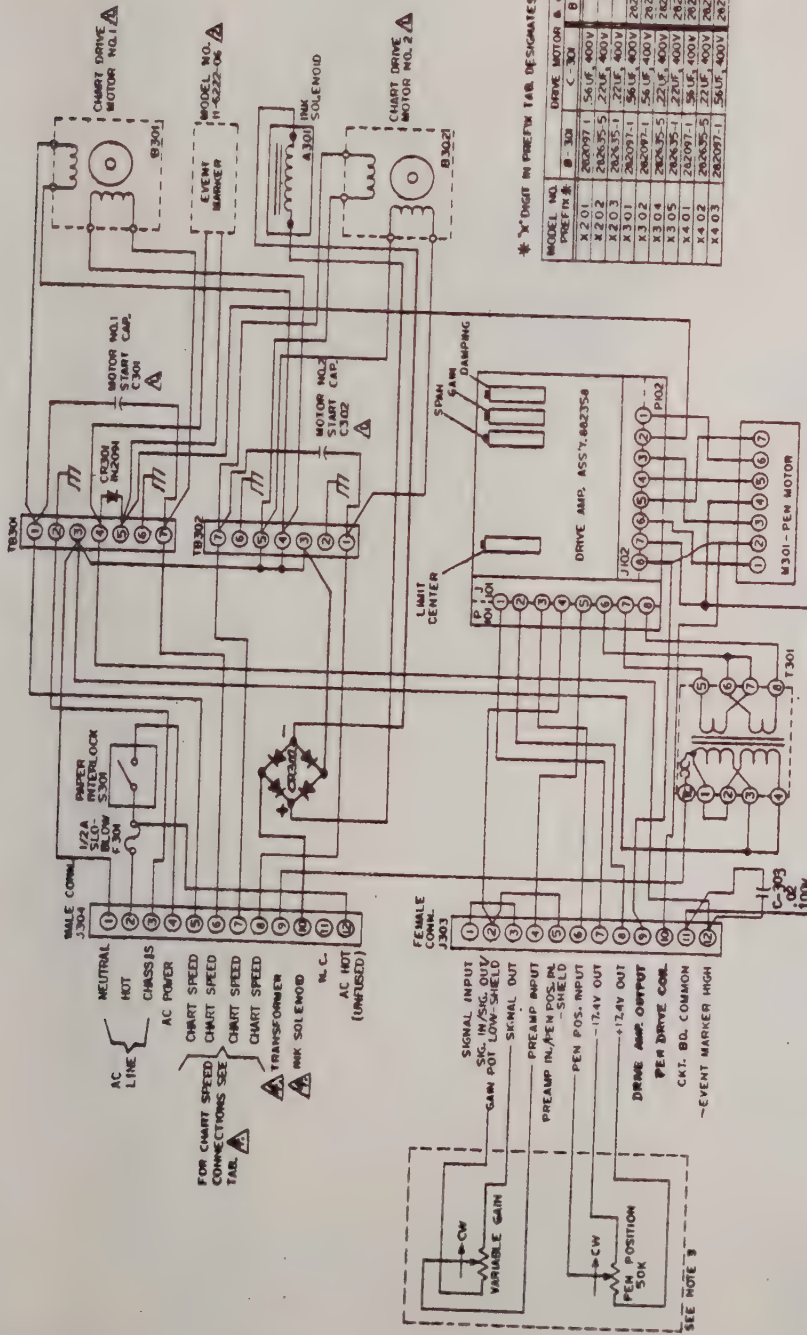


FIGURE 8-10
ACCESSORY CHART TAKE-UP
MODEL 11-6402-09





* X DIGIT IN PREVIEW TAB DESIGNATES ALL SENSITIVITIES.

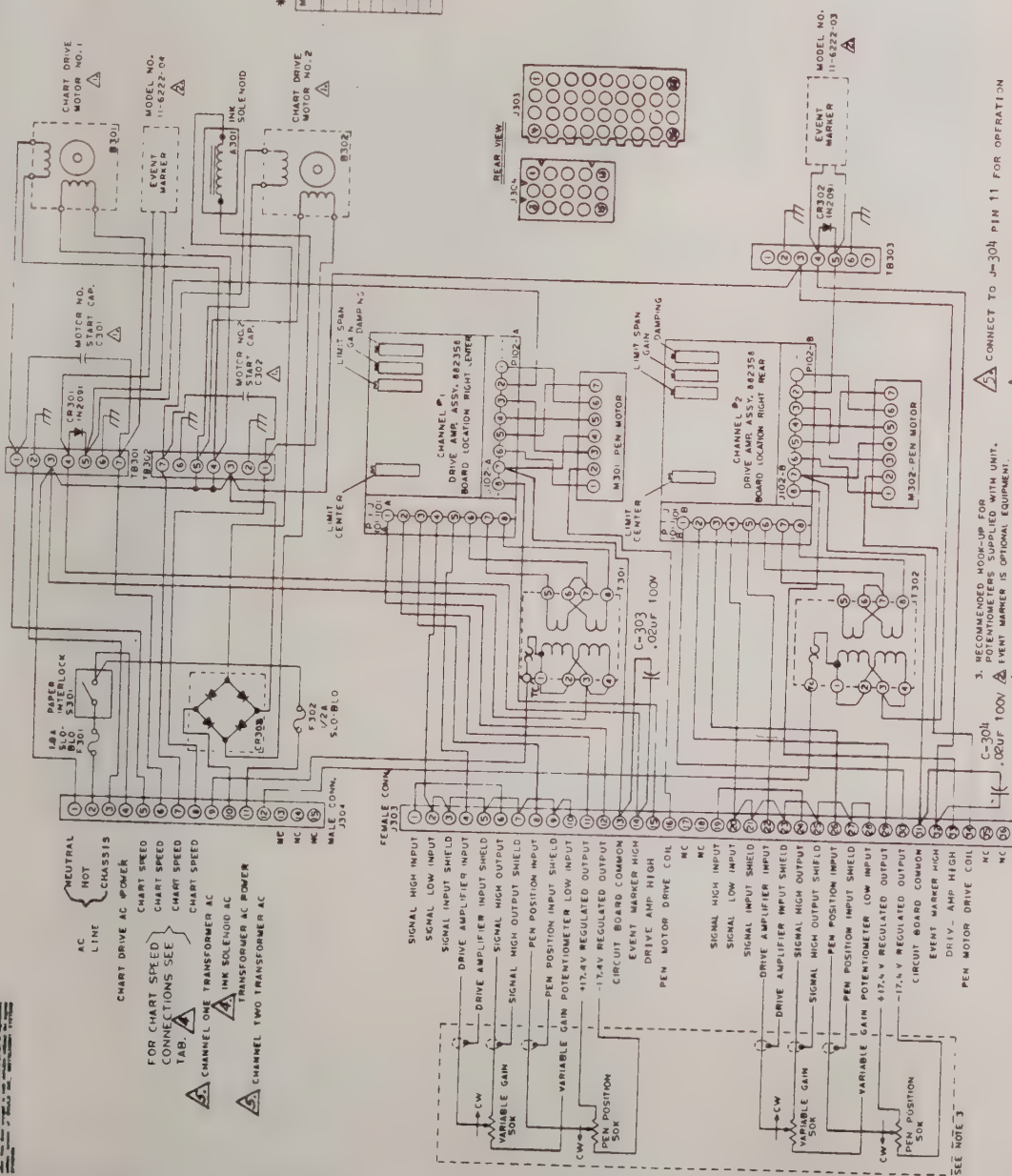
MODEL NO.	DRIVE MOTOR	A. CAPACITOR	CHART SPEED & PIN NO. J-304
			FATEST SECOND THIRD FORTH
X 2 0 1	262097-1	561F, 400V	6 5 3
X 2 0 2	262635-5	221F, 400V	6 5 3
X 2 0 3	262635-1	221F, 400V	6 5 3
X 3 0 1	262097-1	561F, 400V	6 5 3
X 3 0 2	262635-5	221F, 400V	6 5 3
X 3 0 4	262635-1	221F, 400V	6 5 3
X 4 0 1	262097-1	561F, 400V	6 5 3
X 4 0 2	262635-5	221F, 400V	6 5 3
X 4 0 3	262097-1	561F, 400V	6 5 3

- 1 0.00
- 2 0.01
- 3 0.02
- 4 0.03
- 5 0.04
- 6 0.05
- 7 0.06

- 1. CONNECT TO J-304 PIN 3 FOR OPERATION
- 2. RECOMMENDED HOOK-UP FOR POTENTIOMETERS SUPPLIED WITH UNIT.
- 3. EVENT MARKER IS OPTIONAL EQUIPMENT.
- 4. FOR PROPER COMBINATION OF STARTER CAPACITOR AND DRIVE MOTOR, SEE TABLE.

NOTES:

XXXX-6917-00
XXXX-6917-XX
APPLICABLE FOR ABOVE MODELS
WALKER
MODEL NO. SEE ABOVE
SCHEMATIC
MODEL NO. SEE ABOVE
10/75



X DIGIT IN PREFIX TAB DESIGNATES ALL SENSITIVITIES.

MODEL	NO. PREP.	B - 300	DOVE MOTOR	B - 302	DOVE MOTOR	CHART SPEED (IN MIN.)	NO. 304
4.2.1	28315 ¹	187.4	400V	—	—	—	—
4.2.2	28283 ⁵	187.4	400V	—	—	—	—
4.2.3	28283 ⁵	224.6	400V	—	—	—	—
4.3.1	28315 ¹	187.4	400V	28282 ²	334.6	400V	—
4.3.2	28315 ¹	187.4	400V	28282 ²	334.6	400V	—
4.3.3	28283 ⁵	224.6	400V	28282 ²	334.6	400V	—
4.4.1	28315 ¹	187.4	400V	28282 ²	334.6	400V	—
4.4.2	28315 ¹	187.4	400V	28282 ²	334.6	400V	—
4.4.3	28283 ⁵	224.6	400V	28282 ²	334.6	400V	—

3. RECOMMENDED HOOK-UP FOR POTENTIOMETERS SUPPLIED WITH UNIT. A EVENT MARKER IS OPTIONAL EQUIPMENT.

 CONNECT TO J-304 PIN 11 FOR OPERATION

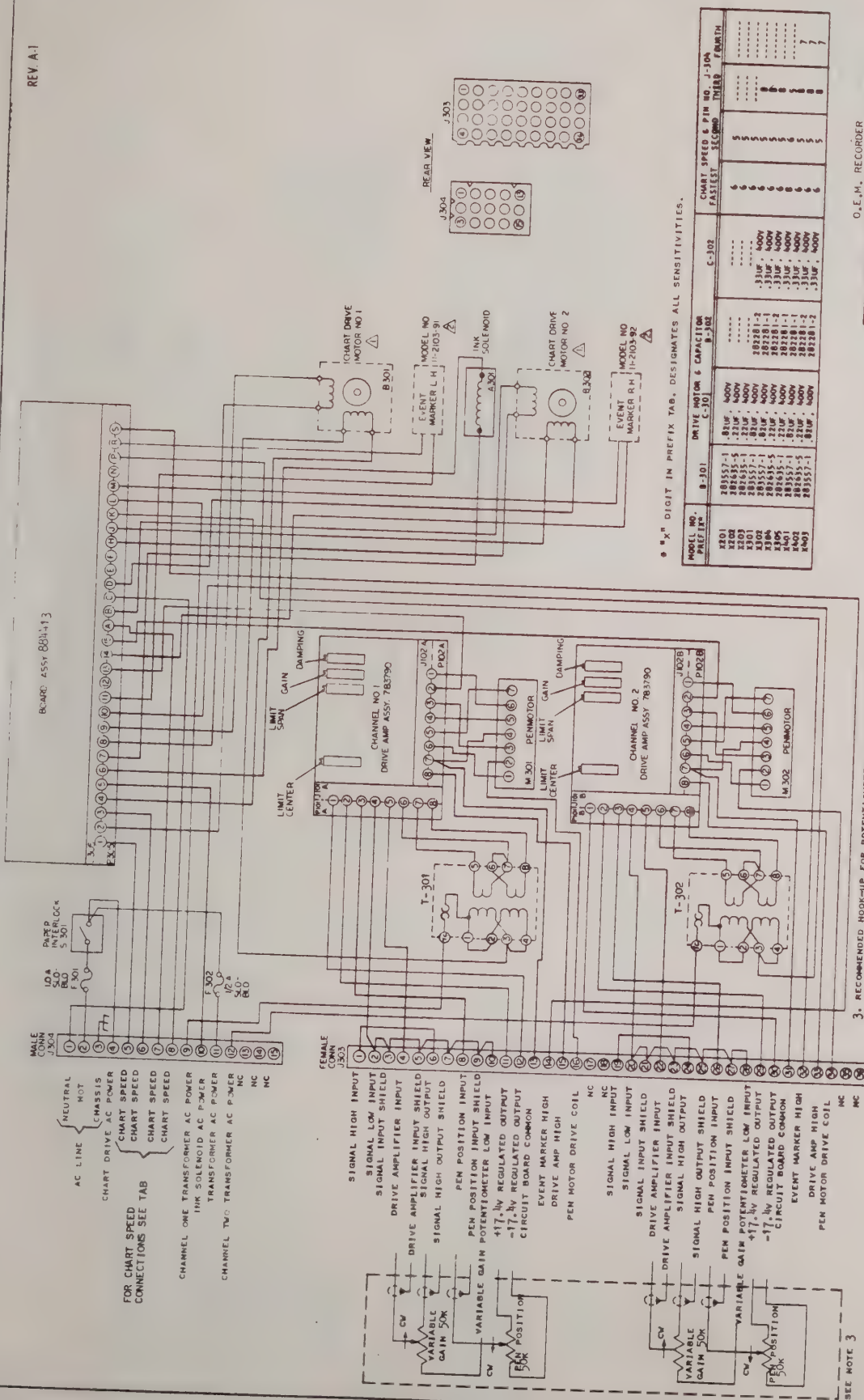
 FOR PROPER OPERATION OF STARTER, CAPACITOR AND DRIVE MOTOR, SEE TABLE.

NAME	DATE	BY	MODEL	TEST	GRADE
WALKER			MODELS XXXX-6827-00	96795	6
V. L.	2/7				
W. CHEEEMAN					

Gould Inc
 Instrument Division
 Cleveland, Ohio 44114 U.S.A.
 202035

NAME	DATE	BY
MODELS XXXX-6827-00	2/7	WALKER
SCHMATIC		V. L.
96795		W. CHEEMAN
1967	6	

Gould Inc
 Instrument Division
 Cleveland, Ohio 44114 U.S.A.
 202035



* "X" DIGIT IN PREFIX TAB, DESIGNATES ALL SENSITIVITIES.

MODEL NO.	DRIVE MOTOR & CAPACITOR	CHART SPEED & PIN NO. J-304
PREFIX		FASTEST SECOND THIRD FOURTH
X301	281557-1 .81UF .000V	6
X209	281557-1 .81UF .000V	6
X208	281557-1 .81UF .000V	6
X304	281557-1 .81UF .000V	6
X205	281557-1 .81UF .000V	6
X201	281557-1 .81UF .000V	6
X202	281557-1 .81UF .000V	6
X203	281557-1 .81UF .000V	6
X204	281557-1 .81UF .000V	6
X205	281557-1 .81UF .000V	6
X206	281557-1 .81UF .000V	6
X207	281557-1 .81UF .000V	6
X208	281557-1 .81UF .000V	6
X209	281557-1 .81UF .000V	6
X301	281557-1 .81UF .000V	6
X302	281557-1 .81UF .000V	6
X303	281557-1 .81UF .000V	6
X304	281557-1 .81UF .000V	6

- RECOMMENDED HOOK-UP FOR POTENTIOMETERS SUPPLIED WITH UNIT.
- EVENT MARKER IS OPTIONAL EQUIPMENT.
- FOR PROPER COMBINATION OF STARTER CAPACITOR AND DRIVE MOTOR, SEE TABLE.

O.E.M. RECORDER

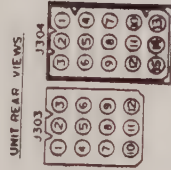
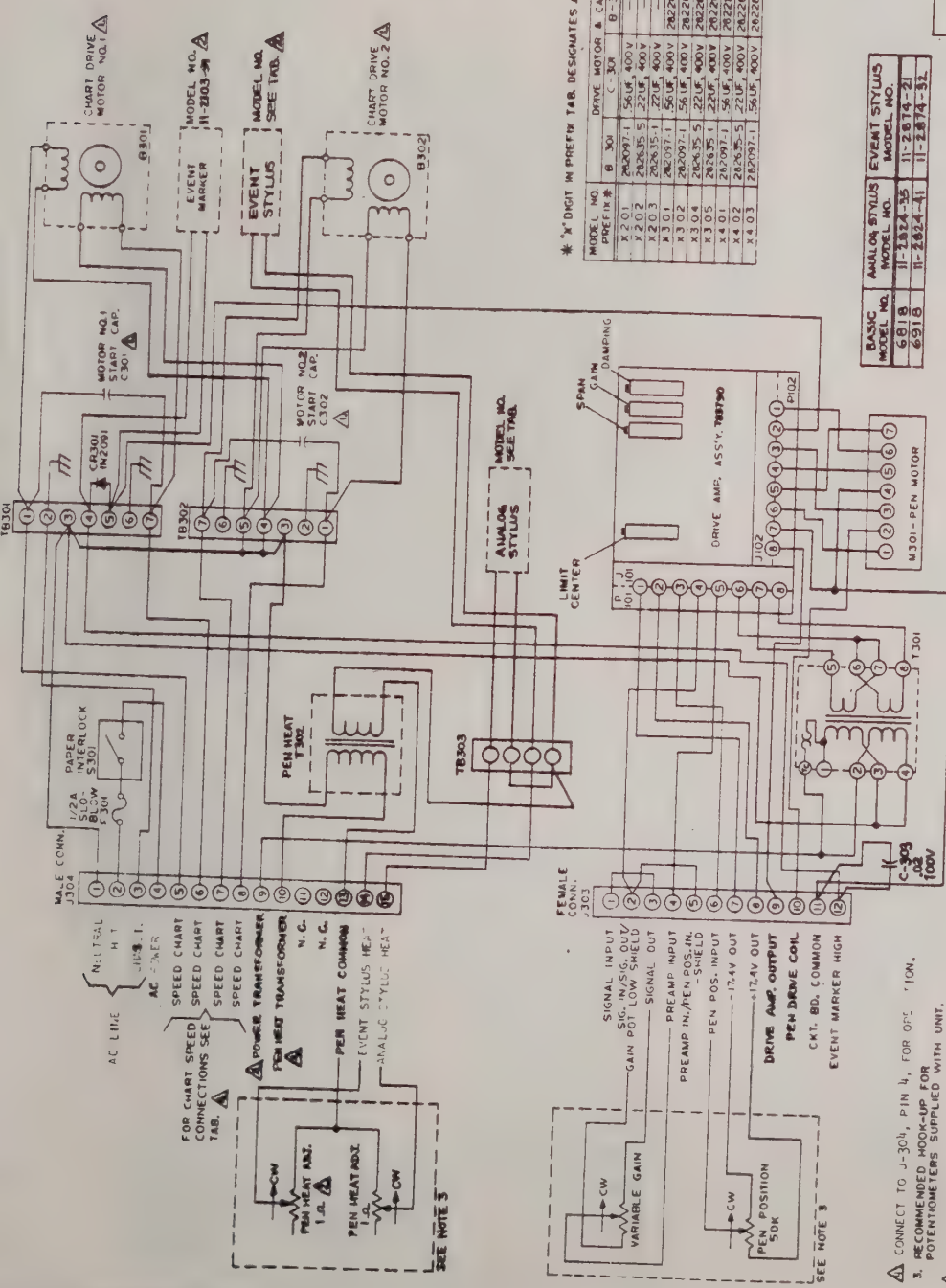
SCHEMATIC

MODELS XXXX-6927-00

94795

284414

SEE NOTE 3



* X DIGIT IN PREFIX TAB. DESIGNATES ALL SENSITIVITIES.

MODEL NO.	PREF. #	DRIVE MOTOR & CAPACITOR		CHART SPEED & PIN NO. J-304	
		B-302	C-302	FASTEST	SECOND
X 2 0 1	282097-1	56UF, 400V	---	6	5
X 2 0 2	282097-1	56UF, 400V	---	6	5
X 2 0 3	282097-1	56UF, 400V	---	6	5
X 3 0 1	282097-1	56UF, 400V	---	6	5
X 3 0 2	282097-1	56UF, 400V	---	6	5
X 3 0 3	282097-1	56UF, 400V	---	6	5
X 3 0 4	282097-1	56UF, 400V	---	6	5
X 3 0 5	282097-1	56UF, 400V	---	6	5
X 4 0 1	282097-1	56UF, 400V	---	6	5
X 4 0 2	282097-1	56UF, 400V	---	6	5
X 4 0 3	282097-1	56UF, 400V	---	6	5

BASIC MODEL NO.	ANALOG STYLUS MODEL NO.	EVENT STYLUS MODEL NO.
6818	11-2814-33	11-2814-21
6918	11-2814-41	11-2814-51

- △ CONNECT TO J-303, PIN 4, FOR OPT. TION.
- △ RECOMMENDED HOOK-UP FOR POTENTIOMETERS SUPPLIED WITH UNIT.
- △ EVENT MARKER IS OPTIONAL EQUIPMENT.
- △ FOR PROPER COMBINATION OF STARTER CAPACITOR AND DRIVE MOTOR, SEE TABLE.
- NOTES:

XXXX-6818-00

XXXX-6918-00

APPLICABLE FOR ABOVE MODELS

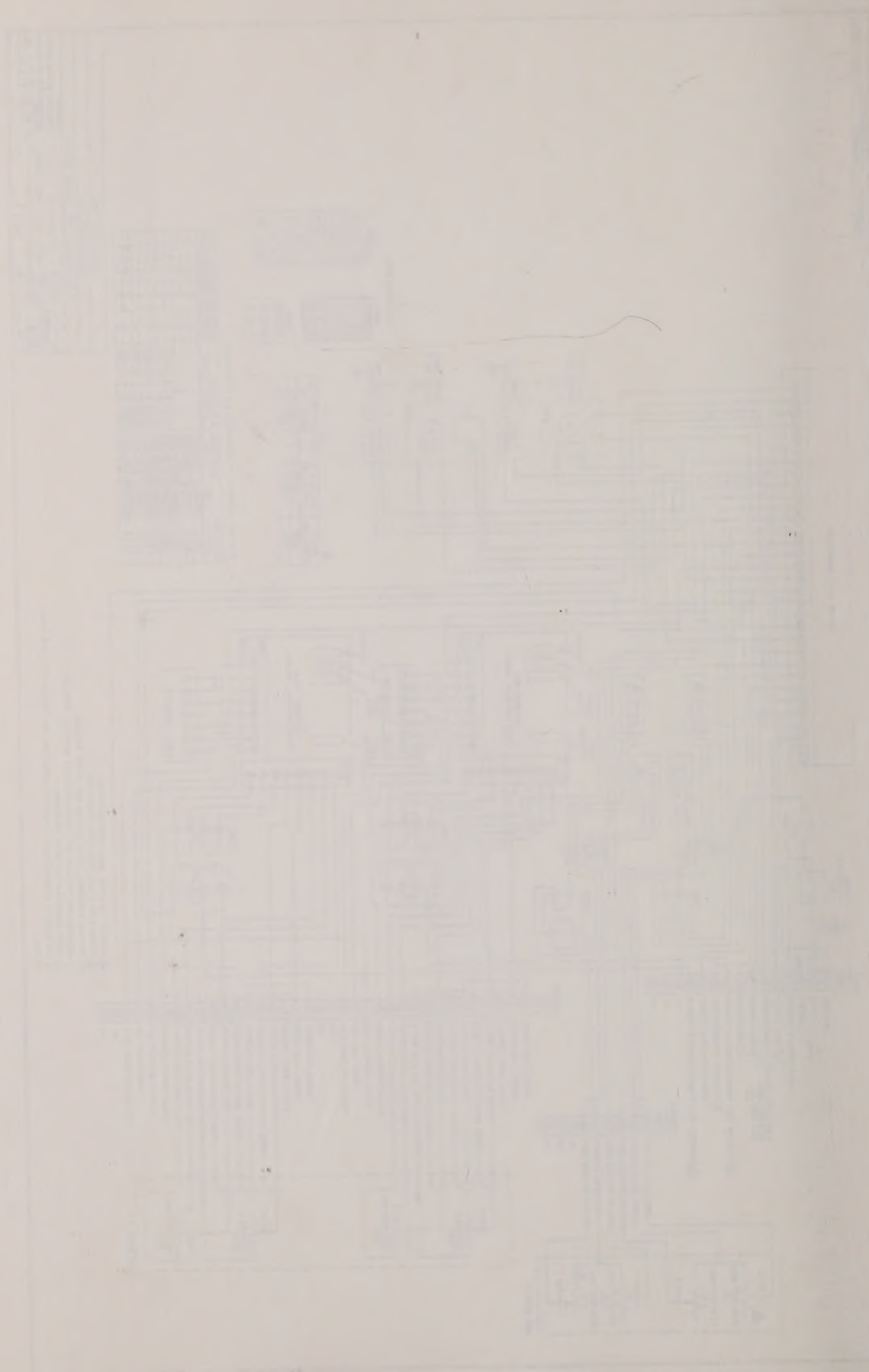
SCHEMATIC MODEL NO. SEE ABOVE

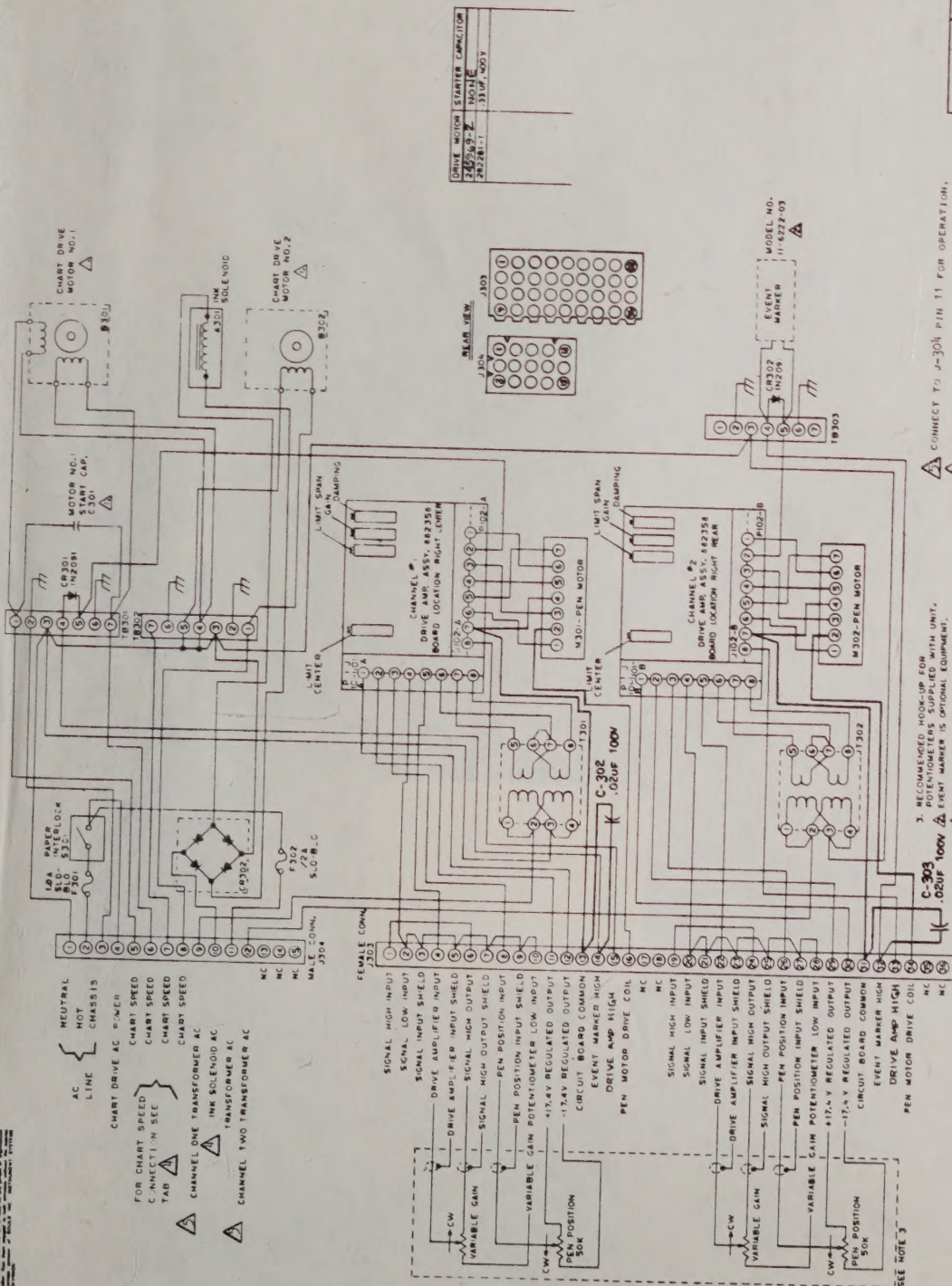
SHARIT

DATE 5/24/65

REV 5

284175





3. RECOMMENDED HOOK-UP FOR POTENTIOMETERS SUPPLIED WITH UNIT.
 EVERY WANNER IS OPTIONAL EQUIPMENT.

△ CONNECT TO J-30A PIN 11 FOR OPERATION.

△ CONNECT TO J-30B PIN 1 FOR OPERATION.

DRIVE MOTOR	STARTER CAPACITOR
24599-2	NONE
28281-1	33 UF, 400V

MP MASTER



MA34649